

The Aviation Historian[®]

The modern journal of classic aeroplanes and the history of flying



+ THE TRIDENT:
the great british giveaway



issue no **16**

NEW BOOK:

Northrop Delta - AB Aerotransport

Rob J. M. Mulder

At the beginning of the 1930s, night mail services started to become more and more important for European airlines. Navigation and safety equipment had improved drastically and aircraft became much more economical to fly. The introduction of the fast Lockheed Orion by Swissair in April 1932 led to a true revolution within air transport. Everyone wanted aircraft that flew faster than their existing obsolete Fokker or Junkers aircraft did.

In Sweden, AB Aerotransport's Managing Director, Carl Florman, became interested in faster airliners as well. In 1933 he saw, during a visit to Norway, a Northrop Gamma and was interested in a similar aircraft for his airline. Offers were requested and through Northrop's representative, Norwegian aviator Bernt Balchen, AB Aerotransport ordered a passenger Delta 1C and a mail aircraft, the Delta 1E.

The operation of both aircraft was marked by problems and challenges for the pilots. It took them some time to master the aircraft. The Delta 1E never entered service, as it crashed on a trial mail flight. In 1937 AB Aerotransport sold the Delta 1C to Spanish airline Líneas Aéreas Postales Españolas — LAPE. It was in civil and military service until well after World War Two.

Following intensive research, the author describes in detail the history of the Northrop Alpha, Beta, Gamma and Delta (civil and military), as well as the operation of the two aircraft in service with AB Aerotransport, illustrated with many photographs, tables, drawings and colour artwork by Juanita Franz, Mats Averkist and Nils Mathisrud.

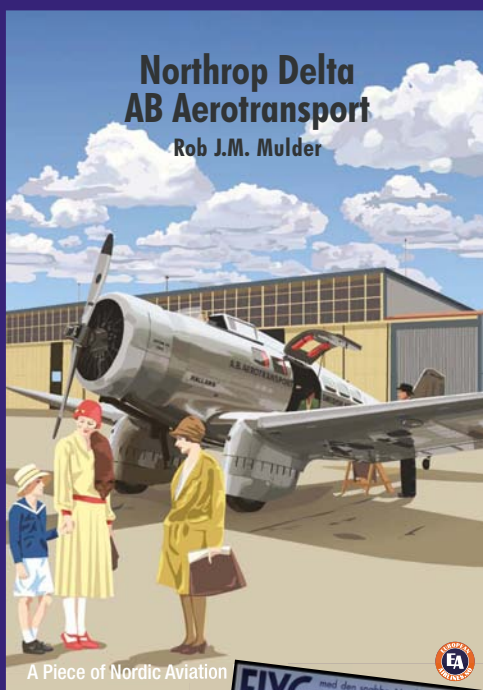
About the book: 21.5cm x 30.2cm, 176 pages, hard covers, 187 b/w photos, many tables, colour section with profiles. ISBN 978-82-93450-00-9

Prices:

Europe/rest of world: € 29 + p.p.

Norway/Sweden: Kr. 250 + p.p.

ISBN 978-82-93450-00-9



Order your copy now at WWW.EUROPEANAIRLINES.NO/EUROSHOP
European Airlines Rob Mulder, Norway

Published quarterly by:
The Aviation Historian
PO Box 962
Horsham RH12 9PP
United Kingdom

Subscribe at:
www.theaviationhistorian.com

ISSUE NUMBER 16
(published July 15, 2016)



EDITOR

Nick Stroud
e-mail nickstroud@theaviationhistorian.com

MANAGING EDITOR

Mick Oakey
e-mail mickoakey@theaviationhistorian.com

PRODUCTION MANAGER

Amanda Stroud

FINANCE MANAGER

Lynn Oakey

For all telephone enquiries:
tel +44 (0)7572 237737 (mobile number)

EDITORIAL BOARD

Gregory Alegi, Dr David Baker, Ian Bott,
Robert Forsyth, Juanita Franzi, Dr Richard
P. Hallion, Philip Jarrett HonCRAeS,
Colin A. Owers, David H. Stringer,
Julian Temple, Capt Dacre Watson

WEBMASTERS

David & Angie Siddall,
David Siddall Multimedia

Published quarterly by *The Aviation Historian*,
PO Box 962, Horsham RH12 9PP, United Kingdom

© *The Aviation Historian* 2016
ISSN 2051-1930 (print)
ISSN 2051-7602 (digital)

While every care will be taken with material submitted to *The Aviation Historian*, no responsibility can be accepted for loss or damage. Opinions expressed in this magazine do not necessarily reflect those of the Editor. This periodical must not, without the written consent of the publishers first being given, be lent, sold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of trade or annexed or as part of any publication or advertising literary or pictorial matter whatsoever.



If you do not wish to keep your copy of *The Aviation Historian* (impossible to imagine, we know), please ensure you recycle it using an appropriate facility.



Printed in the UK by
The Magazine Printing Company
using only paper from FSC/PEFC suppliers
www.magprint.co.uk

The Aviation Historian®

The modern journal of classic aeroplanes and the history of flying

Editor's Letter

"FRIGHTFULNESS IN ITS most drastic form" is how *Flight's* Founding Editor, Stanley Spooner, referred 100 years ago to the Kaiser's campaign to terrorise Britain into submission by sending armadas of sinister hydrogen-filled behemoths to rain indiscriminate destruction on the nation's towns and cities. It was no less frightful for the crews of the German airships, as World War One historian Ray Rimell conveys in his lyrical commemoration of the centenary of Lt William Lee Robinson's dramatic dispatch of SL 11 during Germany's biggest — and most disastrous — airship raid of the entire conflict. It was the first loss of a *Luftschiff* in combat over the British Isles and marked a turning point in the German High Command's belief in the airship as an effective weapon of war.

The development of terrifying war weapons also informs Ted Oliver's analysis of the true extent of wartime technological co-operation between Germany and Japan a quarter of a century later. Both nations were capable of creating world-class warplanes; had they pooled their resources, the results could have been devastating for the Allies — so how and why did co-operation become no-operation? Ted explains all in *Hands Across The Water?*, which starts on page 86.

There's plenty about the more benign uses of aviation in this issue too, including Ken Honey's delightful recollections of flying Daks with Silver City in Libya in the late 1950s, and Professor Keith Hayward's review of the painful procurement of the Trident for BEA, a process one wag characterised at the time as having "a beginning, a muddle and an end . . ."

Finally, don't forget that our full, up-to-date index is available as a free PDF download from our website, which is also full of other goodies including film clips and our social media feeds — at www.theaviationhistorian.com.

FRONT COVER *Three steps to heaven? Keith Hayward's profile of the Trident's descent into development hell before metal was even cut on the first prototype begins on page 10 . . .* TAH ARCHIVE

BACK COVER *Unconventional wisdom — Willard Custer's peculiar but proven channel-wing concept aircraft, the CCW-5.* HOWARD LEVY

FROM THE EARLIEST DAYS OF MANNED-FLIGHT, THROUGH TO THE PRESENT
DAY AND BEYOND - XTENDED HAS GOT AVIATION COVERED.
LISTEN IN NOW, FOR FREE

HANDS UP - WHO'S
DOWNLOADED XTENDED?

XTENDED
EUROPE'S PREMIER AEROSPACE
INTERNET RADIO PROGRAMME

WWW.AVIATION-XTENDED.CO.UK

HAND-CARVED DESKTOP MODELS



A wide range of desktop model aircraft held in stock from all eras, carved from kiln-dried mahogany and hand-painted with a perfect finish and careful fine detailing.

Personalised and bespoke models are our speciality. Our master craftsmen will create a model of any aeroplane or helicopter in any paint scheme to your specifications.



BRAVO DELTA MODELS

UNIT 4, TOLL GATE COURT, WITHERIDGE, DEVON EX16 8PU
T: 01884 860625 E: aircraft@bravodeltamodels.com
W: www.bravodeltamodels.com

10



46

20



74



56



106

100



CONTENTS Issue No 16

3 EDITOR'S LETTER

6 AIR CORRESPONDENCE

10 TRIDENT: BRITAIN'S FORK IN THE ROAD?

Professor Keith Hayward FRAeS continues his series on the political punch-ups and consequent lost opportunities suffered by Britain's post-war aircraft industry with a look at the protracted procurement of the Trident 1 for BEA

20 THE RELUCTANT OVERNIGHT HERO

100 years ago German airship SL 11 was shot down over Hertfordshire by 21-year-old Lt William Leefe Robinson RFC; First World War specialist Ray Rimell details the airship's fateful last sortie and its fiery demise

30 BLACK ON WIGHT

On a recent photographic sortie with Spitfire IX RR232, Richard Paver captured an image containing more than 110 years of British military history, as Mick Oakey explains

34 THE OTHER STOCKHOLM RUN

Scandinavian aviation historian Nils Mathisrud investigates Norway's semi-clandestine wartime transport service operated in concert — if not always happily — with BOAC

46 AN ENGLISHMAN IN NEW YORK

Our regular series based on newly-discovered rolls of film taken by aviation journalist John Stroud continues with a flying visit to see all-helicopter New York Airways in 1958

56 SPIES IN COLD WAR SKIES

Doug Gordon describes the early years of the West's Cold War strategic reconnaissance effort, in which Britain and the USA undertook a series of flights deep into hostile territory, from Korea to the Soviet Union and the Arctic

70 AN EYE FOR DETAIL: TO HELL AND BACK . . .

Juanita Franz's series on notable airframes and their markings continues with a profile of *Hell's Angels*, the first US Eighth Air Force Boeing B-17 to complete 25 missions

74 SILVER CITY IN THE LAND OF BLACK GOLD

Former Silver City Airways First Officer Ken Honey shares his recollections — and photographs — of a memorable two-year posting to the company's operation in Libya

86 HANDS ACROSS THE WATER?

Ted Oliver examines the true extent of technological co-operation between Nazi Germany and Imperial Japan, and explores why neither nation fully trusted the other

100 SIX DRAMATIC MINUTES OVER ANGOLA

August 1988: a BAe 125 carrying the Botswanan President to Luanda appears on the radar screen of a Cuban-manned Angolan MiG-23 *Flogger* — lock on — fire! Tom Cooper recounts what happened next . . .

106 WILLARD CUSTER & THE CHANNEL WING

Nick Stroud chronicles the uphill struggle of self-taught American inventor Willard Custer to bring his highly unconventional channel-wing concept to the world

120 ARMCHAIR AVIATION

125 LOST & FOUND

126 MACCHI'S SKY SCOOTER

Italian aviation historian Gregory Alegi traces the history of the diminutive Macchi-Nieuport M.16 biplane, three of which were ordered by the US Navy in 1921 to be evaluated for their potential use aboard submarines

130 OFF THE BEATEN TRACK

AIR CORRESPONDENCE



Letters to the Editor

Swift questions, slower answers

SIR — Thank you for Keith Hayward's article on the Vickers Supermarine Swift (*High Anxiety*, *TAH11*). I remember the events from my school days, though my memory is that the problems of the Swift were played down by the media. The Hunter's difficulty with gun-firing interfering with the engine seemed to get more coverage.

I have never seen any answers to two questions. The first is what was the technical reason for the Swift becoming uncontrollable at high speeds, while the Hunter had no such difficulty? The second is why this was not picked up during the flight test programme? Professor Hayward does not suggest it, but was this a case of bad news from the technical staff being ignored by either the manufacturer or the Ministry, in the hope that it would go away?

Is there anyone around who could comment on either of these issues?

Dr C.G.B. (Kit) Mitchell

Fleet, Hampshire

[It's a pair of very good questions! We asked premier British Cold War aviation history specialist Tony Buttler if any documentation existed which pinpointed why the Swift became uncontrollable at high speeds in its early development, and he kindly supplied a handful of contemporary official reports. The earliest of these, AAEE/5719,i/1, covering trials undertaken during January–May 1954, states that "Handling trials showed that the Swift F.1 had several major deficiencies which made it unacceptable for full Service use". These included:

(i) Severe "pitch-up" at high Mach numbers above 25,000ft at low values of g, seriously impairing the usable turning performance;

(ii) a marked loss of elevator control above Mach 0.91;

(iii) heavy elevator control forces at high IMN;

(iv) marked nose-down trim change with

extension of airbrakes above Mach 0.96 (IMN 0.94);

(v) a marked wing-drop between Mach 0.93 and 0.96 (IMN 0.92 and 0.94);

(vi) engine surge with or without gun-firing;
(vii) turning performance at altitude limited to a low value by onset of buffet.

Report AAEE/5719,i/2, covering handling trials of the modified Swift F Mk 2 during March–August 1954 finds "longitudinal handling similar to, but worse in some respects, than those criticised on the Swift F Mk 1".

Incorporating further modifications to the elevator control, Swift F Mk 3 WK248 was tested between November 1954 and January 1955, report AAEE/5719,i/3 summarising the results as "considerably

improved". The improvements were that "the pitch-up at high Mach numbers was

controllable", that the landing characteristics were much improved and that the general level of elevator stick forces had been reduced. Concern was voiced, however, about a lack of manoeuvrability at higher altitudes (40,000ft+), "very short practical sortie times" owing to high fuel consumption using reheat and continuing problems with engine surging, with or without the firing of weapons: the Hunter of course also famously suffered engine-surge during gun-firing trials.

Report AAEE/5719,i/5, states that longitudinal handling on the F Mk 3 still left a lot to be desired, however, and, following yet more modification by Vickers Supermarine, mainly in relation to the tailplane, the aircraft was returned in F Mk 4 configuration to Boscombe Down for trials during November 1954–February 1955. The report relates that "the aircraft had commendably good climb performance, and, in its final state, had adequate longitudinal control, but there was insufficient lift available to provide adequate





A rollercoaster ride: longitudinal stability problems plagued the Supermarine Swift from its inception — see Kit Mitchell's letter and the Editor's reply on these pages. The example seen here is first production Swift F Mk 1 WK194, which first flew on August 25, 1952. INSET OPPOSITE Supermarine test pilot Mike Lithgow, who was diplomatic about the shortcomings in a 1954 article in RAF Flying Review.

manœuvring at high altitudes". The Mk 4 was fitted with a bigger elevator and revised elevator controls, so it appears that elevator issues were at the heart of the type's controllability problems. In an interview in *RAF Flying Review* in November 1954, Supermarine chief test pilot Mike Lithgow unsurprisingly drew a discreet veil over the type's shortcomings when asked about the addition of a variable-incidence tailplane on the Swift: "A variable-incidence tail, we have found, gives better manœuvrability near sonic speed. Between Mach 0.95 and Mach 1 there were slight trim changes which a pilot flying in combat would find a nuisance". A minute from the Chief of the Air Staff to the Secretary of State on February 8, 1955, in contrast, makes no bones about the unsuitability of the Swift: "I feel bound . . . to advise you that on defence grounds the RAF cannot accept the Swift Mk 1, 2, 3, 4 or 6."

If any readers have further technical detail on the elevator and longitudinal stability issues that plagued the Swift, please get in touch! — Ed]

Gatty not Getty

SIR — I enjoy my subscription and especially the cover story in Issue 14 of *TAH* about the Supermarine Seagull V in Australia.

I write in the hope that you might publish this correction about Wiley Post's navigator on page 84 of the same issue. In the article *Young Japan* a bracketed comment states "Winnie Mae (in which

Americans Wiley Post and Harold Getty were attempting to fly around the world)". Harold Getty was in fact Harold Gatty and he was not an American but an Australian, born in Tasmania, not all that far from where I live in Southern Australia. He was known as an extraordinary navigator and helped develop new and improved methods. A year after the circumnavigation with Wiley Post, Gatty was offered American citizenship by President Hoover but declined, although he did accept a Distinguished Flying Cross — unusual for a citizen and a non-American.

One may read more about him at the *Australian Dictionary of Biography* site: www.adb.anu.edu.au/biography/gatty-harold-charles-6288.

There is an excellent display in the Smithsonian Air & Space Museum in Washington DC which includes the *Winnie Mae* and plenty of information about the flight.

Lindsay Howe Queenscliff, Victoria, Australia

[Quite right; we must take more water with it when proofreading — Ed]

A welcome distraction

SIR — Issue No 9 of *TAH*, with its article on *Operation Creek Party*, made fascinating reading for me, as all of these aircraft overflew my grandfather's house in Offenbach, about 15km east of Rhein-Main Air Base (RMAB), while I as a young German schoolboy waited for them to distract me from my homework. KC-97s were



LEFT *Subscriber Christoph Schneider from Hesse in Germany remembers seeing Operation Creek Party in action as a schoolboy — see his letter on this page.*
ABOVE *A model of the Smalko MAC-1/SMA-1 flying tank; see J-C Charbonel's letter, also on this page.*

always by far my most favourite aircraft, owing to their distinctive sound. As my window pointed south, my homework took much longer than it should, with the occasional Globemaster, a rare Cargomaster, lots of C-54s, C-118s and later C-130s thrown in for additional pleasure and entertainment.

I have attached a picture of the official *Creek Party* sign outside its operations building at RMAB, listing all the participating units; the building was within walking distance of the base's western apron.

In the article it is mentioned that only a handful of aircraft were regularly deployed to RMAB. That might be true for the majority of periods, but I have a distinct memory of counting in one case 12 KC-97s in an unbroken row in the landing circuit into the base at one time — no civilian aircraft interfered. I have to assume that this would have been a full-effort deployment, probably in conjunction with the annual *ReFoGer* exercises when *REturn of FORces* to *GERmany* meant that not only Army but also Air Force assets were rotated to Germany.

Very nice magazine, indeed.

C.A. Schneider *Kriftel, Hesse, Germany*

Another Soviet flying tank

SIR — I can offer some information about the 1937 Mikhail Smalko MAC-1 or SMA-1 to supplement *Russia's Real Flying Tanks* (TAH13).

Based on the BT tanks from the 1930s, this machine had received a faired hull to improve its aerodynamic performance and a thinner armour of various thicknesses in a special quality of steel (later used on the Il-2 *Shturmovik*). Armament was two DT 12.7mm heavy machine-guns in the turret and a ChKAS 7.62mm gun in the nose,

synchronised to fire through the propeller arc.

On the ground the propeller could be folded into specifically-designed bays which were then closed by armoured covers.

Like all BT tanks it could run either on wheels or on tracks. On wheels it was expected to reach 120km/h (75 m.p.h.) thanks to its 720 h.p. Mikulin M-17 engine. Maximum flying speed would have been 200km/h (125 m.p.h.) with a service ceiling of 2,000m (6,560ft).

To lift the 4,500kg (9,920lb) weight of the machine, two folding wings with a span of 16.2m (53ft 2in) when fully deployed offered a wetted area of 32m² (344ft²). The inner sections of the wings were to be armoured.

Range was 180–200km (110–125 miles) on tracks, 280–300km (175–190 miles) on wheels and 800km (500 miles) in flying mode.

A full scale mock-up had been constructed by the time the project was cancelled.

Jean-Christophe Charbonel *via e-mail*

Lancaster firebomber base

SIR — Terry Harrold has written to me with a correction to my *An Eye For Detail* article on the Lancaster firebomber in *TAH14*. During the period covered by the article, Northwestern Air Lease (NWAL) had its operational base at St Albert, not Fort Smith.

St Albert was a dirt/gravel airstrip in farmland on Township Rd 544, north-west of Edmonton. NWAL would move its operations to Fort Smith during the fire season, and it did not become the company's permanent base until 1985. St Albert airfield is now an industrial estate. The airstrip is no longer active and only limited helicopter operations are undertaken from the site.

Juanita Franzi *Bondi Junction, NSW, Australia*

A delicate touch

SIR — Jonathon Pote's tale on page 44 of Issue 14 (*New Year on Skyline Ridge*) of a Douglas DC-3 engine start problem at Bangkok ("... a large hammer and some slightly more sophisticated tools were applied ...") reminds me that such difficulties with the Pratt & Whitney R-1830 were not uncommon but could usually be overcome by deliberate induction of a backfire, the shock of which hopefully freed up the item causing the trouble. So, having engaged the starter motor, the drill was to juggle the throttle while at the same time making intermittent use of the priming switch; this usually worked, but if

not then the large hammer was brought into play and applied to the appropriate spot which, as I recall, was somewhere on the carburettor body which housed the offending valve, needle jet or whatever.

As to his subsequent in-flight soaking, surely all unpressurised aircraft leaked to some extent — in my experience they certainly did. It was said that a Dakota pilot could always be identified by his oil-stained trousers, resulting from incoming rain mixing with hydraulic fluid leaked from the wiper motors; this I can also vouch for!

Harry Liddell *Fairford, Gloucestershire*



ALAS, POOR PREDATOR farewell to a film-prop ...



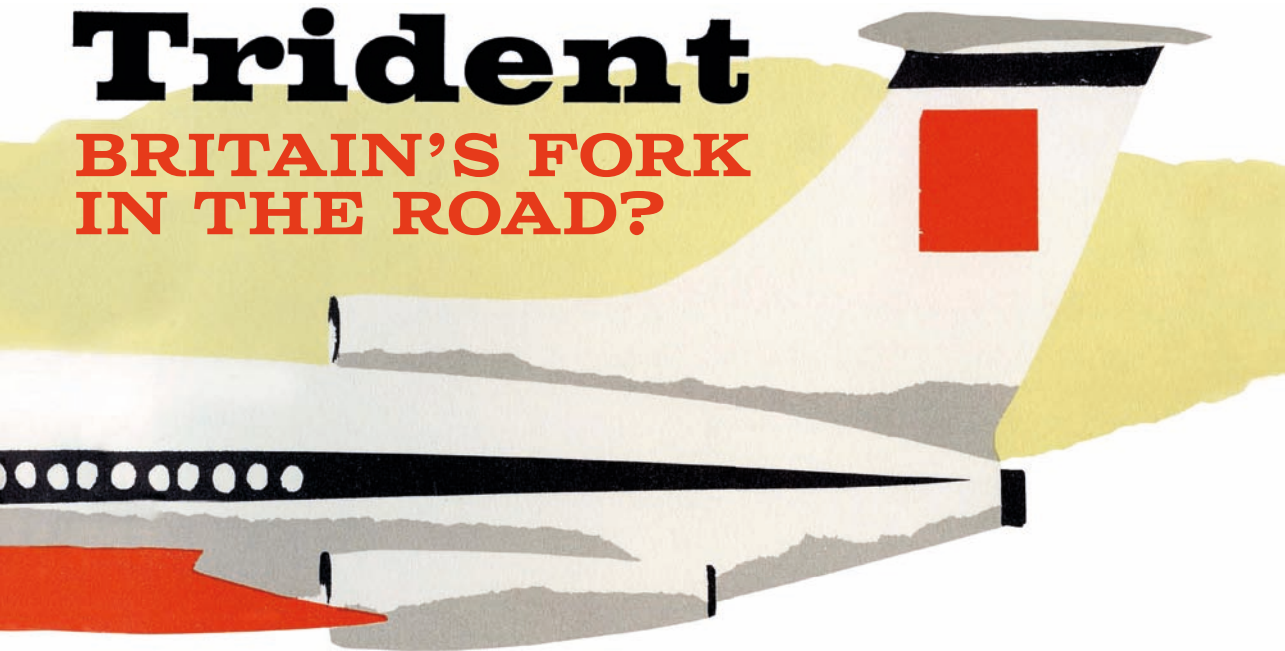
AT THE END of our article on the fictional Scott Furlong Predator (A Very British Bird of Prey, TAH15) we asked whether anyone knew what happened to it after filming of *The Plane Makers*, for which it was created in 1965. Subscriber Steve Mitchell of Staines, Middlesex, did — it was used on location in Aylesbury, Buckinghamshire, the following year in a simulation of a crash scene in the popular ATV soap opera *Emergency-Ward 10*.



TAH ARCHIVE X 2

Trident

BRITAIN'S FORK IN THE ROAD?



Continuing his series on the political backdrop to some of the most significant episodes in the development of Britain's post-war aircraft industry, **Prof KEITH HAYWARD FRAeS** turns his attention to the procurement of the Trident for BEA — a tragedy of errors which saw Britain hand the USA an uncatchable lead in the highly competitive jetliner market

THE 1955 CANCELLATION of the Vickers V.1000 military transport and its airliner derivative, the VC7, is often viewed as *the* major failure of Britain's post-1945 civil aerospace policy. This is contestable.^{1*} But a clearer and far more damaging decision was the "tailoring" of the de Havilland 121, later to become the Trident, to a requirement set out by British European Airways (BEA). This lost the British aircraft industry an opportunity to forestall Boeing's successful entry into the medium-haul jet market with the three-engined 727, which would subsequently dominate the sector for a generation.

The most obvious villain in this sad story is BEA, whose shifting requirements undermined the Trident's wider commercial appeal; yet the airline's initial steadfast support for the D.H.121 was in some senses quite heroic, standing against Treasury and Ministry interference. Always in the background, however, were the effects of government policy, which forced reliance on a single domestic customer, and the underlying weakness of the UK aircraft industry, which forced it either to seek state aid or to follow

the dictates of a dominant domestic customer.²

Led by Winston Churchill, the Conservative Government came to power in 1951 determined to end the policy of direct support for civil aircraft. Instead, projects would be funded by a mixture of private capital, buoyed by the anticipated profitability of the latest generation of aircraft, and launch orders from the nationalised airlines. In practice, problems affecting key programmes, notably the D.H.106 Comet and the subsequent government rescue of its manufacturer, de Havilland, forced a slower transition to the new regime. The government also wanted to improve the underlying strength of the aircraft industry by encouraging rationalisation through mergers, to be promoted by manipulating the award of public contracts.

From a legal standpoint the nationalised airlines — BEA and the British Overseas Airways Corporation (BOAC) — were free to choose their own equipment, but there was a strong expectation they would "buy British". However, this could be costly; in addition to progress payments, the airlines would also carry the costs of "proving" airliners once in service, which could be very expensive, especially if the aircraft

* ENDNOTE references, indicated by numbers at appropriate points in the text, are provided at the end of the article.



TAH ARCHIVE

encountered problems that affected availability.³ By the mid-1950s BEA's business plan, centred around a fleet of turboprop-powered aircraft, was under pressure from competitors "rushing to jets", namely the French Sud Aviation Caravelle, the first short/medium-haul jetliner. Britain had no immediate answer, although de Havilland offered a Comet derivative. Concerned about the competition from jet operators, BEA rapidly adjusted its fleet-planning to include the Comet and a future new medium-range jet airliner.

LAUNCHING THE TRIDENT

At a press conference in April 1957 BEA's chairman, Lord Douglas of Kirtleside, presented the airline's views on the future. In addition to six Comets as an interim jetliner, it wanted 24 advanced jets, with a preference for a 70-seat aircraft. Four companies had submitted designs to BEA's outline, these being:

- the Bristol Type 200;
- Avro (Hawker Siddeley Group) Type 740;
- Vickers VC11 (derived from the VC10);
- de Havilland 121.

The notion of buying the Caravelle, despite its British content — Rolls-Royce Avon engines and the nose and cockpit "borrowed" from the Comet — was dismissed out of hand. Development costs

ABOVE A magnificent publicity photograph of the third Trident 1, G-ARPC, which appeared alongside the first two examples at the SBAC show at Farnborough in September 1962, a mere two weeks after its first flight on August 25. Despite the innovative jetliner's sleek lines and excellent performance, its development suffered from political interference from the outset.

were estimated to be in the region of £20 million (equivalent to some £400 million today).⁴

The Ministry of Supply (MoS), the industry sponsor, wanted a speedy decision, "otherwise the thing will drag on indefinitely, with the risk of our losing the opportunity of repeating the 'killing' we made with the [Vickers] Viscount".⁵ The Ministry was prepared to fund a prototype and a suitable engine, "in order to have adequate control over development".⁶

The Treasury, however, was less impressed. It was unprepared for the "bombshell" request for two types of aircraft and dismissed the "Caravelle bogey" as the usual MoS hankering after the old days of direct government funding.⁷ At the end of August 1957, under considerable pressure to approve funding so that the news could be announced at the SBAC show at Farnborough in September, the Treasury agreed to the purchase of Comet 4Bs for BEA, but not to the new jet or its engine.⁸



ABOVE An artist's impression of the Bristol 200, designed by project office staff at Filton to BEA's specification for a subsonic short-range jetliner. Similar in configuration to the D.H.121, with three rear-mounted engines and a high-T-tail, the unbuilt Bristol 200 had a span of 91ft (27.75m), and was to accommodate 79–99 passengers.

On September 4, 1957, BEA formally requested Treasury permission to acquire a new jet aircraft, namely the de Havilland 121.⁹ The airline had wanted to stay with Vickers, but unfortunately the company "was not prepared to develop the type of aeroplane required". The same applied to the Bristol and HSG proposals and initially to de Havilland. However, having lost a substantial BOAC order to Vickers for the VC10, "de Havilland [has] accepted the views of the Corporation about the best type of aircraft to meet the requirement, and the company [has] now submitted proposals which are closely tailored to the BEA specification".¹⁰

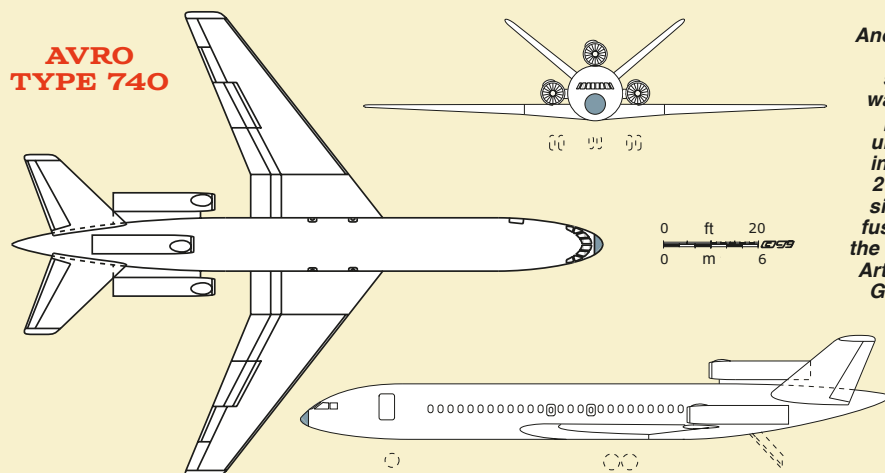
The MoS was asked to order a prototype at a cost of £2.5 million (£45.3 million today). The Treasury felt that the cost estimates of £1 million (£22.3 million) per aircraft was not unreasonable based on the Comet experience. However, "none of the reasons listed for preferring de Havilland

as the manufacturer of the new aircraft touches on the cost of development or the ability of the manufacturer to bear this cost". Officials were puzzled by the rejection out of hand of Avro, which, as part of the Hawker Siddeley Group, "represents one of the wealthier firms in the industry, and also one which has a dire need of a new project to keep it alive as an aircraft firm".¹¹

A DEAL COMES TOGETHER

The Treasury felt that an initial order for 24 aircraft should be big enough for de Havilland to develop the new type as a private venture; officials saw no reason to buy a prototype, although they were attracted to the novel idea advanced by the MoS that a proportion of the estimated development costs of the engine — £5 million (£112 million) — could be repaid by a levy on sales. "This is the first time the Ministry of Supply [has] proposed assistance for the development of an engine for a

AVRO TYPE 740



Another contender for the BEA specification was Avro, which proposed an unusual design in which the No 2 engine would sit atop the rear fuselage between the fins of the V-tail. Artwork by CHRIS GIBSON © 2016



ABOVE FROM LEFT *William Sholto Douglas, 1st Baron Douglas of Kirtleside, BEA's Chairman during 1949–64; Peter Thorneycroft, who, as Chancellor of the Exchequer, held the government's purse strings from January 1957 to January 1958; Harold Watkinson, Minister of Transport & Civil Aviation from December 1955 to October 1959.*

civil aircraft in this particular form, and whatever one may think of it, or of the whole question of government assistance to the aircraft industry, it is an improvement [at] any rate on the old-fashioned open-ended commitment of total or shared development costs".¹²

A more stringent official also noted that "this is probably none of our business, but I wonder how long the MoS is going to play shove-millions with the taxpayers' money? A ray of hope appeared when BOAC and Vickers got together on the VC10 without looking for subsidies — why cannot BEA and de Havilland do likewise?"¹³

By November 1957 the bones of a deal were coming together. The MoS had moved away from directly funding a prototype, Rolls-Royce was prepared to risk £22 million (£492 million) on a new engine (with £5 million from public sources) and a launch order for 24 aircraft should be sufficient to cover costs.

The Treasury was well aware of the importance of the order to Rolls-Royce and especially to de Havilland: "It is scarcely an exaggeration to say that de Havilland's future depends upon it". But, it added, the MoS "has drawn our attention to the fact that both firms will have to stretch [their] resources even with limited government help. They are aware that it is the policy of Her Majesty's Government [HMG] to withdraw from the financing of the aircraft industry as quickly as practicable. But if the axe is brought down too quickly the industry will collapse".¹⁴

Although BEA wanted the de Havilland design, a joint HSG/Bristol design was still in the race and increasingly favoured by the MoS and the Treasury on the grounds that the contract should be used to encourage rationalisation, and that de Havilland appeared to be financially the weaker contestant.¹⁵ Treasury officials felt that "it would be desirable that the Government should seek to

influence BEA, so far as possible, to place [its] order with Bristol rather than de Havilland".

The Treasury was hopeful that the Minister of Transport & Civil Aviation (MoTCA), Harold Watkinson, would "do his best to prod BEA in the direction of [an HSG/Bristol] consortium, because such unions are what the Government [is] trying to encourage in the British aircraft industry".¹⁶ However, a closer examination of the financial position of the companies revealed that in some respects de Havilland was in a far better financial state than was initially evident: "I would pause before arguing that de Havilland does not compare on the grounds of financial strength".¹⁷

In December 1957 BEA reported that, having "tailored [its] design" to BEA requirements, de Havilland was now in the lead "by a fair margin". The specification was very tightly drawn; although de Havilland stated that it generally concurred with BEA, its management also stated that the terms were "more onerous than anything D.H. had previously undertaken".¹⁸ But as de Havilland was already producing Comet 4Bs for the airline, and was in a desperate financial state following the earlier Comet disaster, it was keen to protect its position as BEA's preferred supplier. A formal decision was delayed while the company found financing for a private venture, but de Havilland refused to look for a group option until the D.H.121 contract was confirmed.¹⁹

THE MINISTERIAL DISPUTE

At this point the MoS and MoTCA began to diverge, belying their ostensible unity in public. If BEA had settled on the D.H.121 design, Aubrey Jones, the newly appointed — and harder-line — Minister of Supply thought otherwise. This difference of perspective set the scene for a brief but intense debate within the government, with BEA briefing heavily in support of the D.H.121.



LEFT An artist's impression of the D.H.121 as initially proposed to BEA in the spring of 1957, incorporating a straight-through intake for the No 2 engine and a low-set tailplane. By 1958 the design had been revised to include a T-tail and an S-shaped duct feeding air to the No 2 engine buried in the tail.

BAE SYSTEMS

BELOW Aubrey Jones took over the reins of the Ministry of Supply from Reginald Maudling on January 16, 1957, and served as the last Minister of Supply until October 1959, when the ministry was abolished.

Jones was forthright about the need to use the power of contract to push industry into stronger units, the better to compete with the Americans. As he explained: "To have pursued this policy through mere enthusiasm would have been profitless; to have resorted to compulsion would have been undesirable, and impossible without legislation; the only other course was to use the power of contract".²⁰

The requirement of BEA for a short-haul jetliner was the first civil contract available for such "manipulation". A joint Cabinet memorandum by Harold Watkinson and Aubrey Jones dated January 23, 1958, states that "short of legislation, HMG has no effective method of bringing this policy to fruition other than the power of contract, though economic forces will also play their somewhat slow part. We have therefore been considering whether it is possible to combine the objectives of meeting the BEA requirement and at the same time laying the foundations for the rationalisation and redeployment of resources of the aircraft industry."²¹

The same month the Cabinet met to discuss the issue. Jones and Watkinson fought their respective corners for industry and airline; the Cabinet was unable to resolve the issue and decided to wait for further advice.²² Jones felt that a grouping of HSG/Bristol "alone among British airframe constructors would come within some distance of matching the strength of the present American competition". Hawker Siddeley was also part of a stronger diversified concern and had the most extensive research and development facilities in the country.²³ It was essential that these be put at the disposal of civil industry.

The joint HSG/Bristol design also had a wider market in mind and could meet a Pan American requirement for a larger aircraft. Unless HSG/Bristol got the nod, "we are only too likely to see continued . . . our post-war history of seeking the prizes that are obtainable in the field of civil aircraft but without an industrial organisation capable of realising them".²⁴

This produced an immediate response from Harold Watkinson; Pan Am's requirement had no bearing on the issue and he had no power to force BEA to take the HSG/Bristol aircraft, "nor would I wish to". The British airline had a statutory requirement to act in its best interest and could see no reason why the de Havilland design would not go on to "wider commercial success".²⁵ On January 30, 1958, moving quickly to shore up its industrial position, de Havilland announced the formation of Airco, a group comprising the Fairey Aviation Co Ltd and Hunting Aircraft, to build the D.H.121.

The MoS was still not convinced that Airco's capitalisation of £100 million (£1.7 billion) would be enough. Watkinson was rather more confident.

The Airco consortium appeared to have a solid financial and technical foundation and an order for 24 aircraft from BEA would enable de Havilland to finance the new jetliner's development. The de Havilland group was also felt to be more experienced in the export business.²⁶

On the other hand, Minister of Supply Jones felt that the government should not be rushed into a decision just because there was "public clamour for an announcement". He felt that the Airco offer was too vague and contained the future risk of



With Air France ordering Caravelle short-haul jetliners in 1956, BEA had little choice but to order a fleet of six (upgraded to seven) de Havilland Comet 4Bs in April 1958. The stretched 99-passenger variant entered BEA service in November 1959, initially as a stopgap until the Trident could take over. This BEA Comet 4B is seen being loaded in July 1960.

BAE SYSTEMS



“rescue operations of some magnitude”.²⁷ The Hawker Siddeley Group had been hit hard by the 1957 Defence White Paper, and Jones feared that it might go “out of the aircraft business altogether”.²⁸ The prospect of wider sales was also in Jones’s mind: “It may well be that while BEA, in many ways a uniquely situated airline, inclines [its] preference one way, world demand may incline a different way. If this were to turn out to be so and we had prematurely opted for the aircraft of BEA choice, exports would prove to be limited and the promise of private venture would be nullified.”²⁹

Jones went further: “In the past it has been the practice to allow BEA to specify [its] requirements for a new aircraft without regard to the requirements of prospective foreign purchasers. The future prosperity of the British aircraft industry, however, [will] depend increasingly on its success in the export market. It [will] therefore be important to give greater weight to export prospects in determining the types of civil aircraft to be manufactured in this country. For this reason the present initiative of the HSG/Bristol consortium should be encouraged.”³⁰

The dispute did not go unnoticed by the press. Hawker Siddeley was forced into issuing a public statement, which read:

“Let there be an end to this ill-informed gossip that the product we are offering is technically inferior to that of our competitors, and that we are engaged in some form of plot with the connivance of Ministers of the Crown to force an inferior product on a reluctant customer”.³¹

BEA GETS ITS AEROPLANE

Meanwhile, Lord Douglas of Kirtleside was determined to have the D.H.121. It was exactly the design BEA had specified, and he was confident that de Havilland had the resources to

launch the programme on the back of the BEA order. Watkinson threw his weight powerfully behind the BEA position, stating categorically that he had “no power to require BEA to take the [HSG/Bristol] project against the Corporation’s own wishes. Nor, if I had the power, would I wish to do so”. He continued: “Whatever might go wrong with the project during development, whether delay in delivery or technical difficulty or misadventure of any kind whatever, would be attributed by BEA and by outside critics as my fault and that of the Government, [which] had forced the Corporation to take an aircraft not of its own choosing”.³²

Furthermore, he could not “refuse to allow BEA to place its order where it wants. I have gone as far as I can to help the Minister of Supply with his plans for the future of the aircraft industry. To go further would make me a party to the principle that, in connection with this order, which is being placed by the Corporation and not by the Government, BEA can, in a fashion which [it] believes to be contrary to [its] own best interests and to [its] statutory duty, be used as an instrument of Government policy for bringing about a reorganisation of the aircraft industry”.³³

Both groups of companies were offering their designs as private ventures and both were anxious to achieve overseas sales, and Watkinson could not see “on what grounds we can base a refusal to allow BEA to exercise its technical judgment”.³⁴

The UK clearly could not afford to see two aircraft going forward, as this would only increase the risk of financial failure and a “substantial risk that the Exchequer would have to rescue both of them before the end of the day”. Politically, it was also desirable to avoid a public split with BEA, where there was a risk of wholesale resignations from the BEA board “if they did not get their way”. There was no legal power to stop BEA from



TAH ARCHIVE

ABOVE *The first Trident, G-ARPA, made its maiden flight on January 9, 1962, in the hands of John Cunningham, before undertaking a thorough trials programme. "Papa Alpha" is seen here roaring away on one such test flight. A stellar performer in the air, the type acquired the nickname "groundgripper" owing to its reluctance to get airborne.*

choosing the de Havilland product.³⁵ This broke Jones's resistance. On February 12, 1958, with little further debate, the Cabinet agreed to allow BEA to buy the D.H.121 — by now named Trident — subject to detailed negotiations.³⁶ Accordingly, that August, Airco was awarded a contract for 25 aircraft worth £574 million (£10 billion).

There is no evidence that de Havilland had any qualms about acceding to BEA's original specification. While the design team regarded some of the requirements as being rather onerous, the new aircraft's basic size was consistent with the company's views about wider market requirements. The initial airframe design could seat 111 passengers and the proposed Rolls-Royce RB.141 Medway low-bypass turbofan engine would provide plenty of "stretch" potential.³⁷

Early in 1959, however, BEA began to express second thoughts about its requirement. The airline's commercial division predicted a sharp drop in demand, which would have led to over-capacity in its planned fleet of Trident and Vanguard airliners. As a result, BEA asked de Havilland to alter the Trident design to accommodate a maximum of 87 seats, with a less powerful engine, the RB.163 Spey. The airline

paid de Havilland £200,000 (£3.5 million) for the change, but had, at a stroke, reduced the wider attractiveness of the aircraft and added six months to its development schedule. Objections from within the company were overruled by Aubrey Burke, de Havilland's Managing Director, who vetoed discussion with other airlines until the changes were made.³⁸

The MoS was not happy with the changes, stating that "the aircraft is evidently tailored to meet the needs of BEA with a predominantly short-stage network. Other operators may well require longer stages, which would necessitate an increase in gross weight. BEA is unusual among large operators in having no stages longer than 1,400 miles [2,250km] and a preponderance of stages under 1,100 miles [1,770km]". Wider sales would depend on efficient operation over longer stage lengths, and "it is not known what steps the firm intends to take in developing the D.H.121's range capability, or the extent [to which it has] sought overseas requirements in this matter, but evidently this could be an important consideration affecting the type's sales prospects".

The airline disagreed, arguing that 70 per cent of the world's stage-lengths were less than



ABOVE *With its elegant, aerodynamically efficient contours and powerful Rolls-Royce Spey turbofan engines — as used in contemporary fighters such as the Blackburn Buccaneer and McDonnell Douglas F-4K Phantom — the Trident boasted superb performance in the cruise, often sustaining speeds of up to 600–610 m.p.h. (965–980km/h).*

1,000 miles (1,610km) and that “operators would recognise the advantages of an aircraft specially tailored to short ranges”.³⁹ Kirtleside was quick to defend the downsizing of the Trident, citing the fact that the Viscount had been optimised for the same sector lengths and had sold very well to other operators. The airline also claimed that de Havilland’s own market research had been weak and denied responsibility for blighting the Trident’s prospects.⁴⁰ Given that BEA was funding the programme, there was little that the MoS could do to affect the outcome.

OPPORTUNITY LOST

Inexorably, Aubrey Jones’s gloomy forecasts were borne out by events. In 1959 Boeing launched its 727, designed from the outset for 130 passengers and with scope for further “stretch”. The forecasts of BEA were soon proven to be over-pessimistic and the 727 ran away with the market, with more than 2,000 examples being sold, in contrast to the Trident’s 115. To rub further salt into the wound, BEA would eventually express interest in acquiring a 189-seat version of the 727, a request that was turned down in favour of developments of the Trident.⁴¹

This was not to be the end of the Trident saga, however. As part of the rationalisation process which took place during 1959–62, which saw de Havilland absorbed into Hawker Siddeley Aviation (HSA), the newly formed consortium received retrospectively what was now described as “launch aid” for the Trident.⁴² This did not come without some official doubts: “Critics are already beginning to say that it is ridiculous of us to put money into aircraft such as the D.H.121, which will be outdated by the time it comes into service”.⁴³ But as Vickers was also to receive help for its proposed medium-range VC11 and the ailing VC10 programme, equity dictated that HSA should receive comparable backing.⁴⁴

In 1961 the Government was also approached for help in developing a larger version of the Trident, to be known as the Trident Two. This was largely motivated by HSA’s growing financial problems and the Ministry of Aviation (evolved from the MoTCA and established in 1959) sympathetically supported the request. The Trident Two also had better sales prospects than the original Trident.⁴⁵ Hawker Siddeley Aviation believed that it could secure 140 sales out of a forecast world market of 300 aircraft

In October 1963 the fifth production Trident, G-ARPE, undertook the type's first overseas sales tour, which covered Japan, Hong Kong, Singapore, Pakistan and Syria. John Cunningham was at the controls for the tour, accompanied by BEA Captains A.S. Johnson and W.R. Mitchell. "Papa Echo" is seen here at Tokyo-Narita in Japan, where de Havilland was keen to garner orders from Japanese airline All Nippon. None materialised, unfortunately. Note the open No 2 engine access doors.

TAH ARCHIVE



and asked the Government for £7.5 million (£131 million) out of a total project cost of £27.5 million (£479 million).⁴⁶

The Treasury was not impressed, stating: "This proposal is less than half-baked and it is highly doubtful whether any development of the Trident can be called a promising project".⁴⁷ But by this time the Treasury appears to have given up the will to resist. "Unless we help HSA improve the aircraft to attract more customers, we can say farewell to our £5 million [£87 million]". Rather despairingly, another official asked: "Is it worth spending another £4.25 million [£74 million] in the hope of getting some of our money back?"⁴⁸

It was soon apparent that these estimates were optimistic and that, in its eagerness to bail out HSA during 1960–61, the MoS had been somewhat economical with the truth. An August 1963 memo from the Treasury reveals the strength of its feeling about the MoS:

"Our main concern at the time was the financial soundness of the manufacturing company. It was, to say the least, very remiss of [the MoS] to present a proposition to us in this way. You may feel that it would be flogging a dead horse to complain about this now, but it is very relevant to the proposals which we shall get in due course to add [more] to the existing order."⁴⁹

By January 1964 the Trident had secured only 44 sales, of which 33 were to BEA — and the Treasury was already writing off its investment.⁵⁰

In 1965 the Treasury launched an official review of the history of the Trident, part of which stated that "BEA, for [which] the Trident was tailor-made, [has] changed [its] mind about the version [it] would need for future orders with bewildering rapidity. In terms of equity, however, the party that should really suffer is BEA, [which has] got everyone into this muddle"⁵¹

This was not to be. In 1967, instead of its preferred option — the British Aircraft Corporation's Two-Eleven, an entirely new design — BEA was compelled to take the even larger Trident Three as an interim aircraft while an "airbus" was put into development.⁵² This was something of a dog's dinner of a solution but was perhaps the natural outcome of the failure to launch an adequately-sized D.H.121 aimed at a world market.

The "tailoring" of British airliner designs to the narrow interests of a nationalised airline under pressure to "buy British" was a commercially deadly combination. The practice ended only with the privatisation of British Airways and the arrival of the multinational Airbus consortium, to the considerable benefit of both the national airline and aerospace industries.



ENDNOTE REFERENCES



- 1 See Keith Hayward, *The Blame Game – Vickers V.1000: The Ultimate Political Football?*, *The Aviation Historian Issue 14*, January 2016
- 2 This was an issue that would also affect the Vickers VC10
- 3 For a more detailed review of the "Buy British" policy see Keith Hayward, *Government and British Civil Aerospace: A Case Study in Post-war Technology Policy*, Manchester University Press, 1983, pp31–34
- 4 Minutes of Transport Aircraft Requirements Committee (TARC) meeting, April 2, 1957, The National Archives (TNA) reference AVIA 63/14
- 5 Ministry of Supply (MoS) memoranda to the Treasury, August 1 and August 7, 1957, TNA ref T 228/587
- 6 MoS memorandum to Treasury, August 15, 1957, *ibid*
- 7 Treasury memorandum, August 12, 1957, *ibid*
- 8 Treasury memorandum, August 29, 1957, *ibid*
- 9 BEA memo to the Treasury, September 4, 1957, *ibid*
- 10 *ibid*
- 11 Treasury note on the re-equipment programme, October 30, 1957, and Treasury memorandum November 6, 1957, *ibid*
- 12 This may well be the first formal manifestation of the Repayable Launch Aid (now Launch Investment) Scheme; *ibid*
- 13 Treasury memorandum November 4, 1957, *ibid*. Vickers had launched the VC10 on the back of a BOAC order; by 1959 the cost of development would have taken the former company close to bankruptcy
- 14 *ibid*
- 15 Treasury memoranda November 18, 1957, and January 3, 1958, *ibid*
- 16 Treasury letter to Sir Thomas Padmore, January 3, 1958, *ibid*; Padmore was chairing an internal inquiry into the state of the UK aircraft industry
- 17 Treasury letter to Sir Thomas Padmore, January 10, 1958, *ibid*
- 18 *Flight*, May 29, 1959, p753
- 19 Minutes of TARC meeting, December 6, 1957, TNA ref AVIA 63/14; Hayward 1983, *op cit*, p29 and p33
- 20 Minister of Supply memorandum to Cabinet, February 4, 1958, TNA T228/587. The MoD's OR.339 (TSR-2) contract would soon become an even more powerful "carrot"
- 21 TNA ref CAB 129/91/19
- 22 *Aircraft for British European Airways*, Joint Memorandum by the Minister of Transport & Civil Aviation and the Minister of Supply, January 23, 1958, TNA ref CAB 129/91/19
- 23 This is debatable, however. English Electric probably had the more modern facilities
- 24 Minister of Supply memorandum to Cabinet February 4, 1958, *op cit*
- 25 Minister of Transport & Civil Aviation memo to Cabinet, 4th February 4, 1958, *ibid*
- 26 TNA ref CAB/129/58
- 27 Letter from Minister of Supply to Chancellor Heathcote Amory, February 11, 1958, T228/587
- 28 TNA ref CAB 129/91/19
- 29 *ibid*
- 30 Memorandum by the Minister of Supply, January 24, 1958, TNA ref CAB/128/32
- 31 *Flight*, January 17, 1958, p69
- 32 *British European Airways*, memorandum by the Minister of Transport & Civil Aviation, January 31, 1958, TNA ref CAB/129/58
- 33 *ibid*
- 34 *ibid*
- 35 Treasury memorandum, February 11, 1958, T228/587
- 36 Cabinet minutes, February 12, 1958, *ibid*
- 37 Hayward 1983, *op cit*, p33
- 38 At BEA's suggestion, Boeing and de Havilland discussed the possibility of a joint project. Nothing came of this, but it did entail revealing key aspects of the Trident design. Hayward 1983, *op cit*, p34; based on 1981 interviews with a former senior de Havilland designer
- 39 TARC briefing on history of the Trident, May 1967, TNA ref AVIA 63/41
- 40 TARC minutes, September 16, 1959, TNA ref T225/1635; Hayward 1983, *op cit*, p34
- 41 Treasury memoranda, September 26, 1963, October 15, 1963 and January 2, 1964, TNA ref T225/2318
- 42 Now known as "repayable launch investment". The scheme was essentially the format proposed by the MoS for funding development of the Trident during 1956–57
- 43 Memoranda May 10, 18 and 20 and July 19, 1960, January 17 and 19 and February 13, 1961; AVIA 63/40
- 44 Although it was denied by Vickers, the larger VC11 was effectively a competitor to the Trident. Failing to win orders, the project was terminated in 1962
- 45 Note by the Ministry of Aviation, "Position of the Hawker Siddeley Aviation Group", November 29, 1961, TNA ref T225/2318
- 46 Letter from D.L. Havilland, Deputy Secretary, Ministry of Aviation, to A.D. Peck, Treasury, May 29, 1962, *ibid*
- 47 Treasury memorandum, December 4, 1961, *ibid*
- 48 Treasury memorandum, August 8, 1963, TNA T319/149
- 49 *ibid*
- 50 Treasury memoranda, September 26 and October 15, 1963 and January 2, 1964, TNA ref T225/2318
- 51 Treasury memorandum, June 21, 1965, T319/149
- 52 The airline was nevertheless "compensated" for the forced order; Hayward 1983, *op cit*, pp85–86

Flying the flag for Britain — tenth production Trident 1 G-ARPJ lifts its nose as it departs Hatfield. "Papa Juliet" was delivered to BEA in May 1964 and served with the airline until March 1975. In the next article in this series, the author takes a look at the equally troubled procurement of the Vickers VC10 for BOAC.

TAH ARCHIVE





Lt William Leefe Robinson VC THE RELUCTANT OVERNIGHT HERO

First World War aviation specialist **RAY RIMELL** commemorates the centenary of the biggest airship raid of the conflict, in which the German Navy and Army joined forces for a night attack on London. For one tenacious British pilot it led to the award of a Victoria Cross — for the crew of airship SL 11, however, it ended in a huge fireball over Hertfordshire

ON SATURDAY, September 2, 1916, leaden skies with persistent drizzle heralded a new morning as Londoners began to go about their daily business in the wartime capital. It turned into a depressing day like so many recent others, but towards evening the capital's myriad theatres, cinemas and music halls offered welcome distraction from grievous Western Front casualty lists and ongoing threats of Zeppelin raids. German airships had been conducting attacks against the British Isles since January 1915 and the country's mixed bag of countermeasures had achieved little success in preventing them. To an island race boasting a sprawling empire under the protection of the world's most powerful navy, the fact that German "Zepps" were bombing towns and cities and killing and maiming innocent civilians with virtual impunity, was hard to stomach.

The British public and popular press dubbed the raiders "baby killers" and grew increasingly bitter and resentful, raging against perceived shortcomings of the home defences. It seemed that nothing was ever going to thwart these nocturnal bombers. Yet during the early hours of the following morning came a turning point that was to transfix the nation.

Meanwhile, in Germany . . .

On the same afternoon out on the bleak landing field at Spich Army Airship Station near Troisdorf, south of Cologne, stood an enormous structure; a vast towering wooden shed, the doors of which were slowly cranked

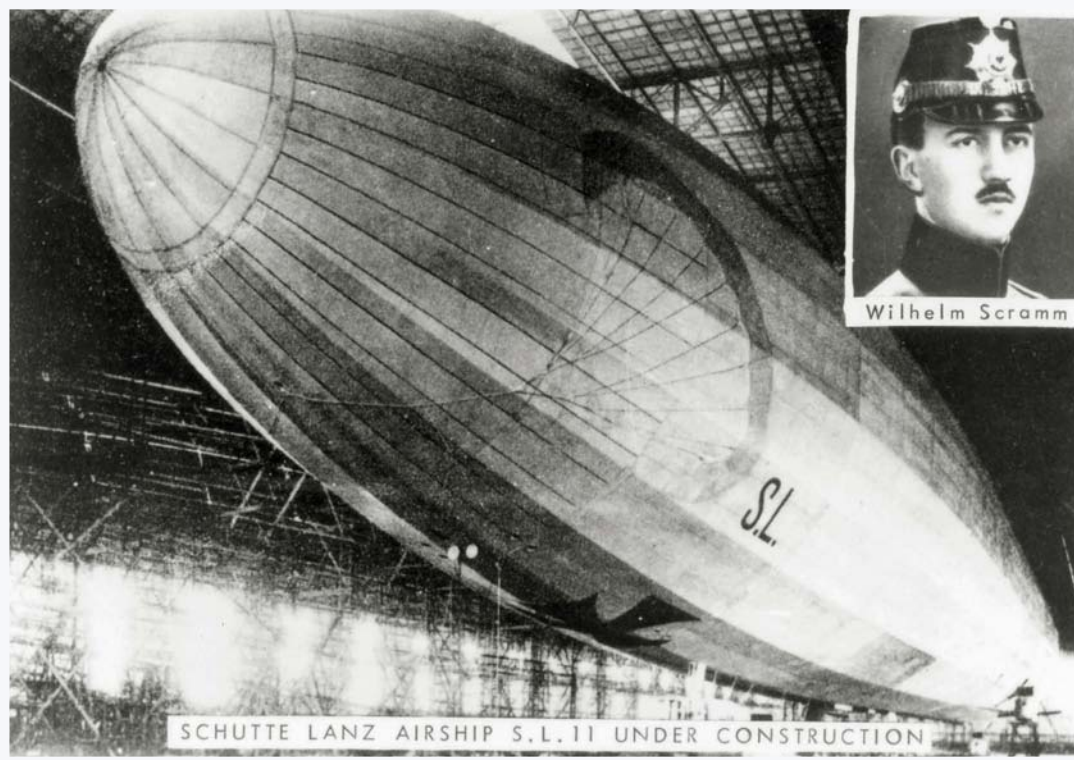
apart. Hundreds of grey-uniformed troops took hold of long trailing ropes and began to haul a massive dun-coloured shape from the hangar's cavernous interior.

Slowly on to the field emerged a new rigid airship, commissioned just one month previously. As it was laboriously withdrawn, the 16-man crew assigned to it looked on with mixed emotions. The vessel was simply enormous. From the snub nose to the tip of the pointed tail, the airship measured more than 570ft (174m) in length and had a beam of nearly 66ft (20m) across at its widest point.

Slung beneath the enormous hull were four streamlined engine gondolas, each enclosing a Maybach 4M HSLu motor delivering 240 h.p. and driving a 5.25m (17ft 3½in)-diameter Lorenzen wooden propeller. High up on top of the airship was an exposed platform for a pair of defensive Maxim machine-guns, and the gondolas mounted similar weapons. Painted on the bows were the large black letters "SL" — for this craft was not a Zeppelin. The stark legend marked it as a Schütte-Lanz, its girders built of light plywood as opposed to the Duralumin of Count von Zeppelin's more numerous designs. The SL ships were unpopular with Germany's Naval Airship Division and such wooden-hulled vessels were largely employed in Army service.

Despite their somewhat heavier structures, to many crews SL rigids offered one significant advantage — the control gondola and forward engine car were separate. This afforded the commander and his execs, not to mention the wireless operator, an environment free of the

OPPOSITE One of the many postcards issued by companies eager to use the sensational destruction of SL 11 to promote their wares, this particularly vivid example was issued by Holborn-based biscuit manufacturer Walker, Harrison & Garthwaites. Leefe Robinson flew a B.E.2c, however, not the Avro 504 depicted! DAVID MARKS COLLECTION



PHILIP JARRETT COLLECTION

ABOVE A contemporary postcard showing SL 11 under construction at the Schütte-Lanz factory at Mockau, near Leipzig. After completion it was moved to Spich Army Airship Station near Cologne, which would become its home port. The inset at the top right-hand corner shows SL 11's commander, Hauptmann Wilhelm Schramm.



ABOVE Schramm (third from right) and the rest of the SL 11 crew at Spich a matter of weeks before their ill-fated sortie to London on September 2, 1916. At the beginning of the war German Army airships had been used for low-level infantry support, but it was soon realised that they had far more strategic value as high-altitude bombers.

FIRESTARTERS — THE POMEROY AND BROCK BULLETS

WITH A POTENTIALLY lethal combination of highly volatile fuel, wood and linen, early combat aircraft were extremely susceptible to fire, pilots often jumping to oblivion rather than face incineration. Armament designers accordingly set about creating new forms of ammunition which would exploit this vulnerability and began devising explosive and incendiary bullets, two of which were used extensively against enemy airships.

The Pomeroy or PSA bullet (**BELOW**), developed by New Zealand engineer John Pomeroy in 1902, was an explosive machine-gun bullet filled with nitro-glycerine. So sensitive that it would explode on striking fabric, the Pomeroy was used by the RFC from late 1916, and ignited the hydrogen gas escaping from the tear in the Zeppelin gas bag created by the bullet's passage. This was not always enough to set fire to an airship, so the design was improved to burst on the surface of the inner envelope. It was quickly adopted by British defence services and its effectiveness led to a marked decrease in the number of German airship attacks.

The Brock bullet, explosive and incendiary, was created by Cdr Frank Brock RN solely for the destruction of airships, Brock believing that the Pomeroy was becoming ineffective, as the Germans had found a means of countering it. They had not, but it was clear that an even more sensitive bullet would yield better results. Brock devised a bullet that would explode between the two envelopes, blowing a hole roughly 1ft (30cm) in diameter which would allow the rapid escape of hydrogen, which would then mix with the outside air and ignite.

Nearly half a million Brock rounds were ordered by the Military Wing, some 400,000 of which were returned to Woolwich for being too sensitive before it was realised that they were indeed proving extremely effective against the airship menace, despite the difficulties of proving it definitively; it was common practice to load ammunition drums with a mixture of Brock, Pomeroy and Buckingham incendiary rounds. Interestingly, the July 3, 1919, issue of British weekly *Flight* stated that in 1916 trials had been undertaken shortly after Leefe Robinson's destruction of SL 11, in which a mixture of Pomeroy and tracer bullets did not prove effective, while Brock bullets alone set fire to a balloon after only six shots. **NS**



ear-splitting noise and debilitating noxious fumes from an adjacent engine that their Zeppelin counterparts in conjoined cabins regularly endured.

As the ship was "weighed-off" and the mooring-rope handlers took up the strain, the airship's crew prepared for its flight. Heavily-garbed in thick flying coveralls, they made their way across the landing field. In the tunic pockets of 24-year-old *Gefreiter* Bernard Jeziorski were a couple of leave passes signed by his commanding officer, as well as two telegraphic payment slips and a receipt for supplementary bread rations. Other crewmembers carried similar documents; motor mechanic Reinhold Porath carried no fewer than five *Urlaubskarten* (leave tickets), along with another July-dated pass and some Cologne tram stubs. *Obermaschinist* Jakob Baumann had postcards secreted in a breast pocket, together with various family correspondence. In one letter his mother reminded him that she was short of milk and fat, thanking him for the bread ticket he sent her earlier. Most of the ship's complement carried a crucifix or rosary beads, and at least one took an old velvet-bound bible aboard.

As the men clambered along the ship's internal catwalk, they separated to make their way to their respective stations; pairs of *Maschinisten* to each of the engine gondolas, the command crew to their enviable forward position. Captaining SL 11 was *Hauptmann* Wilhelm Emil Ludwig

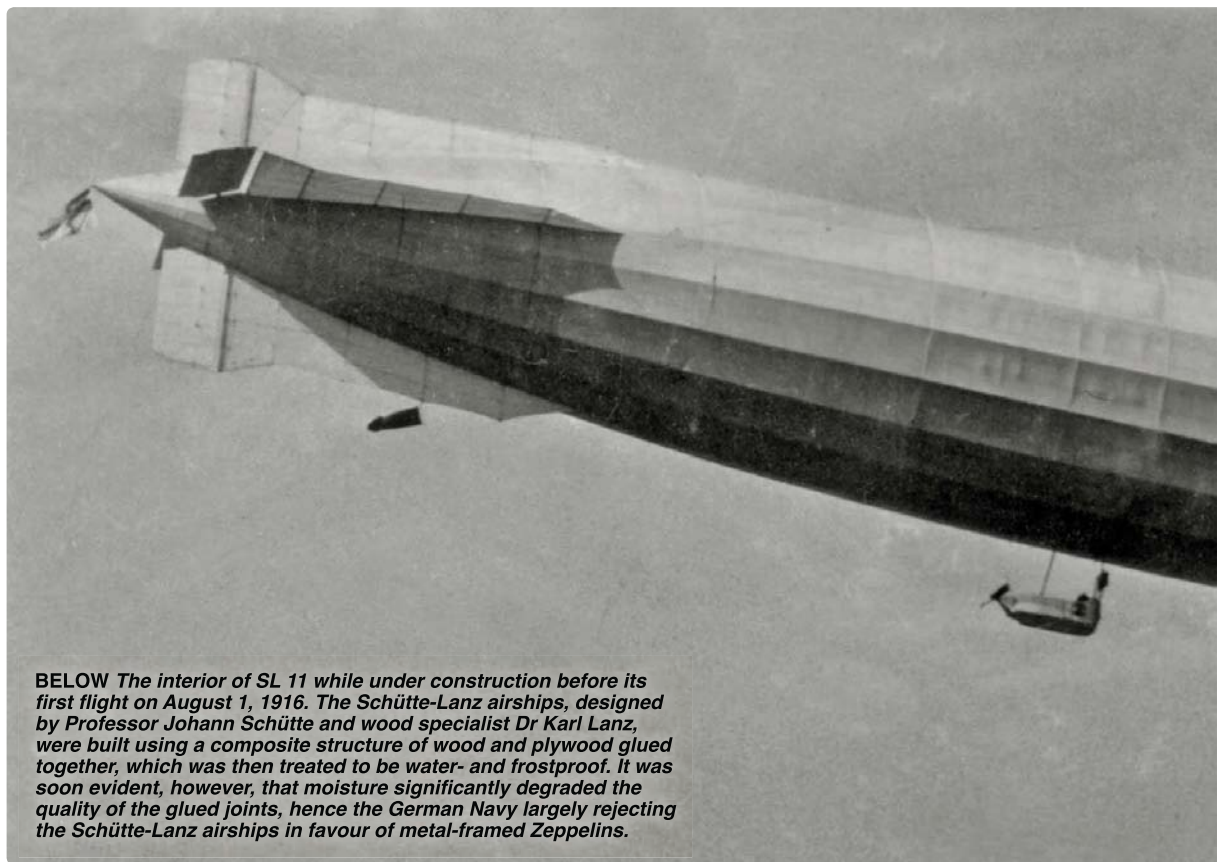
Schramm, an experienced Army airshipman who had served with some distinction in the service, having successfully bombed London's dock areas the previous year.

Schramm was born in London on December 11, 1885, before the family returned to Germany five years later owing to his father's deteriorating health. Now Wilhelm was returning to his birthplace once more, his ship just one element of a combined Army and Navy assault on the British Isles, the biggest airship raid yet mounted. From midday until the mid-afternoon, a dozen German Naval airships set out from their coastal bases. In support the Army fielded three more, along with Schramm's SL 11.

Nach England

As the raiders slowly made their way across the North Sea, the continuing poor weather began to take effect. The air was proving particularly turbulent at high altitude, with strong winds coming in from the south-west. On nearing the English coastline, several of the airships began to ice-up and others were forced to return before reaching their intended targets.

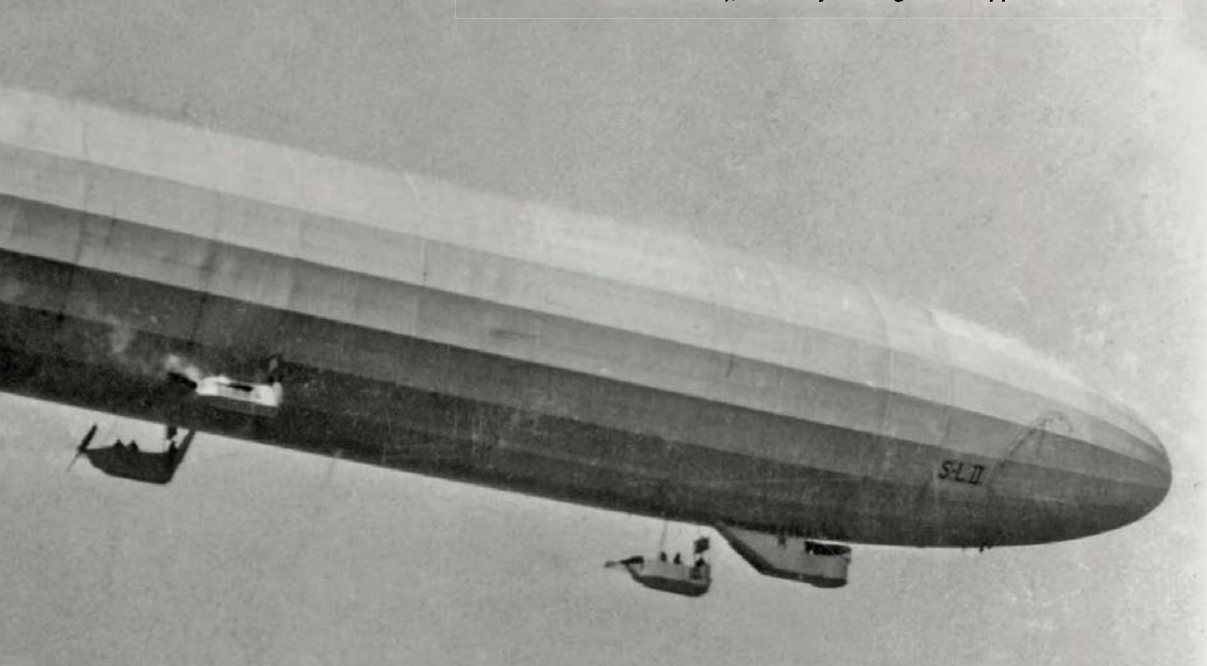
Making landfall over the River Crouch, Schramm ordered the helmsmen to conduct a wide, sweeping course so that London could be approached from the north. Having traversed the Essex towns of Chelmsford and Colchester, SL 11 took a westerly course over Saffron Walden. The ship overflew Royston, then



BELOW *The interior of SL 11 while under construction before its first flight on August 1, 1916. The Schütte-Lanz airships, designed by Professor Johann Schütte and wood specialist Dr Karl Lanz, were built using a composite structure of wood and plywood glued together, which was then treated to be water- and frostproof. It was soon evident, however, that moisture significantly degraded the quality of the glued joints, hence the German Navy largely rejecting the Schütte-Lanz airships in favour of metal-framed Zeppelins.*



A rare photograph of SL 11 in flight. It served for a mere 33 days before being destroyed by Lt Leefe Robinson during the massed airship raid on London on the night of September 2–3, 1916. The weather played a part in the failure of the raid, belts of heavy rain and icy winds at high altitude forcing the airships to disperse. The vast majority of the raiders on this sole combined-forces sortie were German Navy Zeppelins (11 plus one Schütte-Lanz), the Army fielding three Zeppelins and SL 11.



Hitchin, as Schramm endeavoured to obtain his bearings, before finally reaching the outskirts of the capital, the surprised residents of which first heard the deep discordant throb of Maybachs at around 0100hr.

Six high-explosive (HE) and incendiary bombs were sent down near London Colney in order for the airship to gain extra height, and SL 11 began to rise beyond the range of London's outlying anti-aircraft defences. The bombs fell harmlessly into open wheat fields, burned and fizzled out, while eight more bombs were dropped at Bulls Cross, near Enfield.

At 0145hr a single HE and four incendiary bombs were released, one striking outbuildings at Clayhill's Glasgow Stud Farm, killing three prize racehorses. It took the Enfield Fire Brigade more than an hour to quell the fires. Around 15min later another of SL 11's bombs created a 30ft (9m) crater at Little Heath, Potters Bar, rupturing a water main. Further incendiaries burned themselves out in a field at Bolton's Park. As the airship rumbled on, more bombs rattled down from the midships racks. One landed in Ponders End High Street, another near Southbury Road and a third on Enfield Highway. Three more fell on an allotment near Durrant's Park; more on Green Street, a dud on Enfield Highway and another on Old Road.

The bombs caused no casualties but there was plenty of material damage, including another ruptured water main, in Ponders End High Street. More than 60 homes were struck, although none seriously, and a number of tram lines and telephone wires were brought down. Greenhouses belonging to Hertford Road's Smith's Nurseries were shattered by another HE bomb; a second fell on Rainer's Brickfield to no effect and a third damaged three dwellings in Turkey Street.

The airship moved on to Edmonton, where a dud fell in the grounds of Eley's Explosive Works in Angel Road, with another close by on the Ballast Works. Three further bombs landed in Montague Road's sewage farm, to little effect. Now finished with Edmonton, SL 11 lay directly over Alexandra Palace, where it was held by searchlight crews stationed at Finsbury and Victoria Park. Finsbury's anti-aircraft gunners lost no time in opening up a spirited fire on their illuminated target and within minutes Schramm's ship came under an intense barrage.

Inside the control gondola, the commander and his fellow officers flinched as shells exploded around and below their ship, the interior of the car brightly lit by the searchlight beams. At least one of the engine gondolas was struck by shrapnel during this onslaught; a large

jagged hole in the Maybach's crankcase was quickly plugged with cotton waste by a quick-thinking *Maschinist* as the airship ploughed on.

All hell breaks loose

The airship turned sharply over Tottenham, its steersman struggling to evade the shells bursting all around as best he could as the last bombs left their racks. The airship, by this point hastily powering away from the capital to elude the tenacious searchlight and gun crews, was flying at around 12,000ft (3,700m).

At 0205hr, as SL 11 was seeking the relative sanctuary of a cloudbank, the guns suddenly ceased firing. An eerie silence pervaded the control gondola — and then all hell broke loose. From the rear of the airship came a dull thump followed by the roar of a tremendous explosion, as an intense fire tore rapidly through the hull.

The flames sucked up all the remaining hydrogen gas along the length of the airship, which lost buoyancy as gravity took over. Most of the crew were overtaken by the sheer speed of the fire. In the control gondola some had time to jump clear, Schramm among them, as their doomed ship hung momentarily in mid-air, its wooden framework hissing and spitting in the heat. Strips of fabric peeled away in scorched tatters as the airship began a slow slide out of the sky. At about 0220hr, the blazing wreckage smashed to earth in a shower of sparks, striking a barren field in the small Hertfordshire village of Cuffley, near Enfield. There were no survivors.

Excited residents quickly arrived at the scene, some ducking as machine-gun bullets exploded in the flames. They were soon joined by police officers, who quickly formed a rough cordon. Three bodies were found near one of the shattered propellers, burning fiercely and pinned down by a mass of wire cables: one had his legs burnt off and his arms to the elbows. There was hardly a scrap of clothing left on the most badly-burnt victims. One crewmember was found in a standing position, his femurs thrusting up through his body close to the collar bone, yet still clad in a fur-lined flying coat untouched by fire. What was left of another was found with one hand gripped around a charred control wheel. Assuming this to be the commander, policemen placed it to one side. Once all 16 bodies had been extricated from the smouldering wreckage they were brought together and covered with a tarpaulin. Before dawn hundreds of curious sightseers had made their way to the crash site in droves, by car, rail and foot. More than 50,000 arrived in just six hours, the grisly pilgrimage lasting for weeks afterwards.

The loss of SL 11 that Sunday, the first of the raiders to be brought down on British soil,

BRINGING DOWN THE BEHEMOTH

Lieutenant William Leefe Robinson VC and the Destruction of SL II

BORN ON HIS parents' coffee estate in the Coorg region of British India on July 14, 1895, William Leefe Robinson was educated at the Bishop Cotton Boys' School in Bangalore before moving to the UK to continue his studies, attending St Bees School in Cumbria from 1909, where he became a sergeant in the Officer Training Corps. After entering Sandhurst in August 1914 he was gazetted to the Worcestershire Regiment on December 16 that year. By March 1915 he had transferred to the Royal Flying Corps and was sent to France as an observer.

On May 9, 1915, Leefe Robinson was wounded in the right arm while flying over Lille, and after a period of convalescence in the UK he began pilot training, qualifying on July 28, 1915. After special training for night operations, the young airman was posted to No 39 (Home Defence) Sqn RFC, based at Sutton's Farm, near Hornchurch in Essex.

Thus it was that the 21-year-old Leefe Robinson found himself aloft on the night of September 2–3, 1916, in B.E.2c serial 2693 of 39 Sqn's B Flight. The young pilot took off just after 2300hr with instructions to patrol between the squadron's base at Sutton's Farm and Joyce Green, taking the best part of an hour to reach an altitude of 10,000ft (3,000m). It was a clear night, and Leefe Robinson saw nothing until 0110hr, when he spotted Zeppelin LZ 98 caught in searchlights to the south-east, the airship having flown in over New Romney to bomb Gravesend. In his report to his CO, Leefe Robinson described what happened next:

"By this time I had managed to climb to 12,000ft [3,650m] and I made in the direction of the Zeppelin, which was being fired on by a few anti-aircraft guns, hoping to cut it off on its way eastward. I very slowly gained on it for about 10min.

"I judged it to be about 800ft [250m] below and I sacrificed some speed in order to keep the height. It went behind some clouds, avoiding the searchlight, and I lost sight of it. After 15min of fruitless search I returned to my patrol."

Having lost his prey Leefe Robinson continued patrolling his allocated area until, at 0150hr, he noticed a red glow to the north-east of London, taking it to be an outbreak of fire. During the next 10min the airship — SL 11 — was picked up by searchlights and fired on by the Finsbury anti-aircraft gunners. Leefe Robinson's report continues:

"Remembering my last failure I sacrificed height — I was at about 12,900ft [3,900m] — for speed and nosed down in the direction of the Zeppelin. I saw shells bursting and night tracers flying around it. When I drew closer I noticed that the anti-aircraft aim was too high or too low; also a good many shells burst about 800ft [250m] behind — a few tracers went right over. I could hear the bursts when about 3,000ft [900m] from



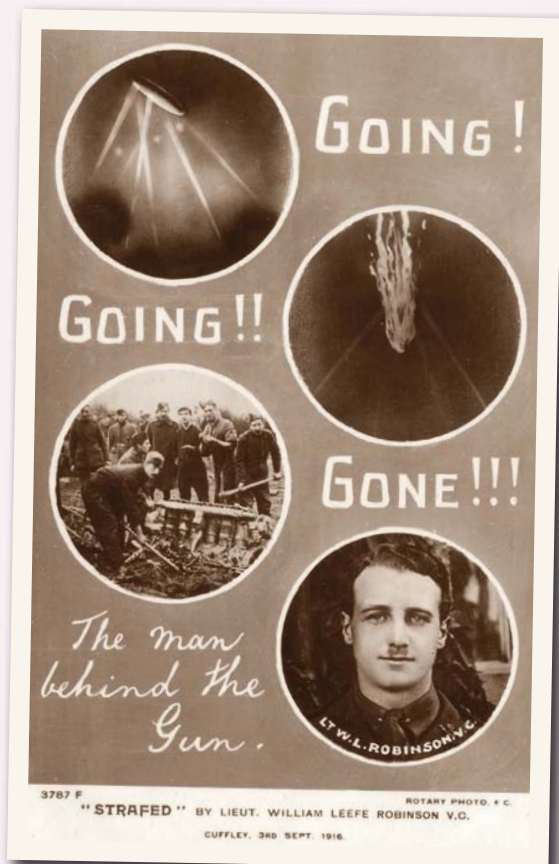
RIGHT This classic contemporary postcard from the Rotary Photo Company, commemorating the dramatic shooting-down of SL 11, shows a timeline of the events. It uses an artist's impressions of the airship ablaze, and a pair of photographs, the uppermost of which depicts soldiers sorting through the wreckage, the lower being a portrait of the "overnight hero", Lt William Leefe Robinson VC. DAVID MARKS COLLECTION

[the airship]. "I flew about 800ft below the airship from bow to stern and distributed one drum [of alternate Brock and Pomeroy bullets — see panel on page 23] among it. It seemed to have no effect. I therefore moved to one side and gave them another drum along the side — also without effect. I then got behind, and by this time I was very close — 500ft [150m] or less below — and concentrated one drum on one part, the underneath rear. I was then at a height of 11,500ft [3,500m] when attacking.

"I had hardly finished the drum before I saw the part fired at glow. In a few seconds the whole rear part was blazing. When the third drum was fired, there were no searchlights on [the airship], and no anti-aircraft was firing. I quickly got out of the way of the falling, blazing [airship] and, being very excited, fired off a few red Very lights and dropped a parachute flare.

"Having little oil or petrol left I returned to Sutton's Farm, landing at 0245hr. On landing I found the [airship] gunners had shot away the machine-gun wire-guard, the rear part of my centre section and had pierced the mainspar several times."

It was later thought that Leefe Robinson himself may have shot away the guard wire that prevented fire from the Lewis gun from damaging the aeroplane's structure. Regardless of the method used, he had become the first British airman to shoot down a German airship on home soil, and was awarded the Victoria Cross "for most conspicuous bravery". **NS**



BELOW Lieutenant Leefe Robinson poses in the cockpit of B.E.2c 2693, in which he shot down SL 11; the airmen beside the starboard wing are holding the upper wing's original centre-section, which was probably damaged when Leefe Robinson shot away the wire guard that prevented the Lewis gunfire from hitting the aircraft's structure.



AIR MARSHAL SIR FREDERICK SOWREY VIA AUTHOR



LEFT *The blazing hulk of SL 11 as it falls to the ground. Although a propaganda coup, the destruction of SL 11 actually masked a pitifully poor response by the British air defences to such a substantial raid — a mere 16 sorties by RNAS and RFC aircraft, three of which were undertaken by one pilot. Fortunately for the denizens of London, the 17 tons of bombs dropped by the airships caused minimal damage and disruption.*

BELOW *One of the smashed gondolas and remains of a Lorenzen propeller straddle a hedgerow bordering the crash site at Cuffley. Pieces of Schütte-Lanz plywood girders form a tangled heap at middle left, seemingly untouched by the scorching fire that took hold of the airship in its death-dive.* VIA AUTHOR



ABOVE *“There wasn’t much of a wreck there for an airship — only about 25 square yards of it . . .” So read a report a few days after the shooting-down of SL 11. The most substantial parts of the behemoth to be recovered were the four Maybach six-cylinder inline water-cooled piston engines, one of which is seen here at lower right.*

persuaded the German Army Airship Service to abandon its England campaign, but the Navy crews pressed on and paid a heavy price for their persistence as more ships fell in flames to defending Royal Flying Corps and Royal Naval Air Service pilots over the following months.

The overnight hero

It was not long before the cause of SL 11's dramatic destruction, witnessed by tens of thousands of people in London and the home counties, became known. Flying a Royal Aircraft Factory B.E.2c of No 39 (Home Defence) Sqn's B Flight, 21-year-old Lt William Leefe Robinson of the RFC had made history. With his Lewis gun armed with newly developed incendiary bullets, young Leefe Robinson had succeeded in bringing down one of the raiders single-handedly to become — literally — an overnight hero (see panel on pages 26–27).

Within days of his success, "Billy" Robinson (RIGHT) was awarded the Victoria Cross, after which his life would never be the same again. Mobbed wherever he went, "the airship VC" received a number of monetary awards and was showered with gifts, letters, and telegrams from an adoring public. Leefe Robinson soon tired of the attention and pressed for a posting in France. His wishes were finally granted, and in April 1917 the newly-promoted captain was posted to France as a Flight Commander with No 48 Sqn.

On April 5, 1917, Leefe Robinson, flying Bristol F.2A Fighter A3337, was leading a flight of factory-fresh Bristol Fighters over the front when the group ran into six Albatros D IIIs above Douai led by *Leutnant* Manfred von Richthofen, the legendary Red Baron himself. Four of the Bristols were quickly dispatched by the D IIIs, the casualties including Leefe Robinson and his observer Edward Warburton, brought down by *Vizefeldwebel* Sebastian Festner.

Taken prisoner, Leefe Robinson spent the rest of the war in various prison camps, where he took part in several abortive escape attempts. Ultimately transferred to Clausthal in the Harz mountains, Robinson fell under the jurisdiction of Heinrich Niemeyer, one of Germany's most notorious camp commandants. Leefe Robinson was badly treated by Niemeyer and the Clausthal guards, the persecution lasting from his arrival in May 1918 to the end of the war.

On repatriation, Leefe Robinson, by this time in poor health, spent Christmas with friends at Stanmore, where he contracted the deadly influenza virus sweeping the world at the time. He died on December 31, 1918, his funeral taking place a few days later at Harrow Weald, with thousands attending the sombre ceremony.

In 1921 a memorial obelisk was unveiled



PHILIP JARRETT COLLECTION

at Cuffley, close to the spot where SL 11 had fallen to earth five years before. In 1988 Leefe Robinson's Victoria Cross was auctioned at Christies, raising £99,000 to provide funds for a children's charity set up by one of his nieces, Gisela Libin. The medal was acquired by Lord Ashcroft and is held in the Lord Ashcroft Gallery at the Imperial War Museum in London. It is entirely fitting that overnight hero William Leefe Robinson is in distinguished company with his fellow VCs a century after his gallant action on the night of September 2–3, 1916, when, according to the *London Gazette*, "he attacked an enemy airship under circumstances of great difficulty and danger, and sent it crashing to the ground as a flaming wreck".



ACKNOWLEDGMENTS The author would like to thank the late Gisela Libin and Rose David, nieces of Capt Leefe Robinson VC, for their longstanding help with this feature, as well as Peter Amesbury, Michael Clark, Dr H-Uwe Oppermann, Air Marshal Sir Frederick Sowrey KCB CBE AFC, Brian Warren of the Potters Bar Historical Society and Richard Smith and Ken Clark of the Purfleet Heritage & Military Centre

RAY RIMELL is Editor of the excellent *Windsock* World War Centenary quarterly publication for modellers of World War One aircraft, and the indispensable Datafile series of monographs. For more info visit www.windsockdatafilespecials.co.uk

BLACK^{ON} WIGHT

Photographer **RICHARD PAVER** recently captured a striking confluence of more than a century of British military and aerospace technology off the South Coast of England

AIR-TO-AIR PICTURES of preserved historic aeroplanes have an extra dollop of appeal when taken against a dramatic or significant backdrop. The accompanying image encapsulates a story spanning 11 decades, from 1861 to 1971, and stretching from cannon via anti-aircraft gunnery and World War Two to missiles and spaceflight.


Looking beyond the obvious star of the show, Spitfire RR232 (see panel on this spread), the vertiginous headland under the fighter's port wing is the very western tip of the Isle of Wight. Lying just off England's South Coast, the island and its environs are rich in aviation history. Some 15 miles directly north is the city of Southampton, formerly the base of Supermarine, and the birthplace of the Spitfire. To the north-east is Portsmouth, home of Airspeed; to the west, the old de Havilland factory and airfield at Christchurch and the flying-boat base at Poole Harbour, among other historic locations. On the island itself, Cowes hosted the 1923 Schneider Trophy seaplane race, and resident aircraft manufacturers have included Saunders-Roe (of which more later) and Britten-Norman.

FROM CANNON TO ROCKET

So, what about the odd-looking structures and their network of connecting roads and tracks in the picture?

The biggest feature, at lower right, is the Needles Battery. Built between 1861 and 1863 as part of Prime Minister Lord Palmerston's extensive programme of fortification against hostile intent from France, it housed six 7in (later 9in) cannon tasked to defend the Solent, the strategically vital stretch of water separating the island from the mainland. As the military threat evolved, trials of quick-firing guns and searchlights were undertaken against agile motor torpedo boats — and in 1913 the Battery's parade ground became the test site for one of Britain's first fixed anti-aircraft guns.

By this time, concerns had arisen that vibrations from the firing of heavy guns were weakening



Spitfire Mk IX RR232 heads south-west over the western tip of the Isle of Wight in late March 2016 — the chalk stacks of The Needles are just off the bottom of the picture. The fortifications of the island's Needles Battery are clearly visible at lower right, while in the upper right-hand corner of the image is the edge of the High Down Test Site, where Black Knight and Black Arrow rockets were ground-fired in static test gantries during the 1950s and 1960s.

FAR BEYOND THE SOLENT —

SPITFIRE RR232/G-BRSF's geographical links reflect a truly globetrotting existence, although its strongest current association is with the South-west of England.

Owned by Exeter businessman Martin Phillips, the fighter made its first post-restoration flight from Filton on December 18, 2012 — the day before the historic Bristol airfield finally closed to flight operations. Since then it has been based at Colerne in Wiltshire and looked after by John Hart, the former chief engineer for Rolls-Royce's company-owned Spitfire. It has been flown sparingly but in 2015 it received its full Permit to Fly and took part in some of the Battle of Britain 75th anniversary events.



A BRIEF HISTORY OF SUPERMARINE SPITFIRE HF.IX RR232

Built at Castle Bromwich in late 1944, RR232 served with the Empire Central Flying School at Hullavington and Boscombe Down. It went into storage at Lyneham in September 1945; in 1949 it was acquired by the South African Air Force and serialled 5632. It was struck off charge in 1954 and sold to Harold Barnett in Cape Town. In 1975 Peter Sledge acquired it and shipped it to Australia; restoration work was done at RAAF Point Cook during 1978–81, and at Bankstown Airport where the static restoration was completed in October 1984.

After a short spell on display at the Royal Australian Navy Museum at Nowra, RR232 was bought by collector

Charles Church in 1985 and shipped to the UK as a potential airworthy rebuild project. It was with Jim Pearce in West Sussex for a few years, and in 2000 the current owner acquired it. Much rebuild work was done by Airframe Assemblies — at Sandown, on the Isle of Wight! — during 2002–05 and also in the owner's Bristol workshop. Final assembly took place at Filton.

Painted as a 1944 Castle Bromwich factory-fresh Mk IX, RR232 carries no unit codes; but it does wear the name *City of Exeter* on both sides of the nose to represent a wartime presentation Spitfire from the owner's home town. **RP**

the rock underlying the fortification. Hence a New Battery was built some 400yd to the south-west — two of its three semicircular gun emplacements are visible at the top right of the Spitfire photograph.

This is where it gets especially interesting — because, after defensive duties through two World Wars, the New Battery and its adjacent patch of sloping clifftop chalk downland became a vital hub for Cold War missile and rocket research.

FROM BLACK KNIGHT . . .

Air Ministry Operational Requirement 1139 of 1954 led to the development of Blue Streak, the medium-range ballistic missile manufactured by de Havilland Propellers. While Blue Streak itself was to be ground-fired on the missile range at Spadeadam in Cumbria and test-launched at Woomera in Australia, development of its re-entry head would be based elsewhere. Partly the responsibility of the Royal Aircraft Establishment at Farnborough in Hampshire, this re-entry head work would require an inexpensive rocket for testing different shapes of head. Black Knight was the result.

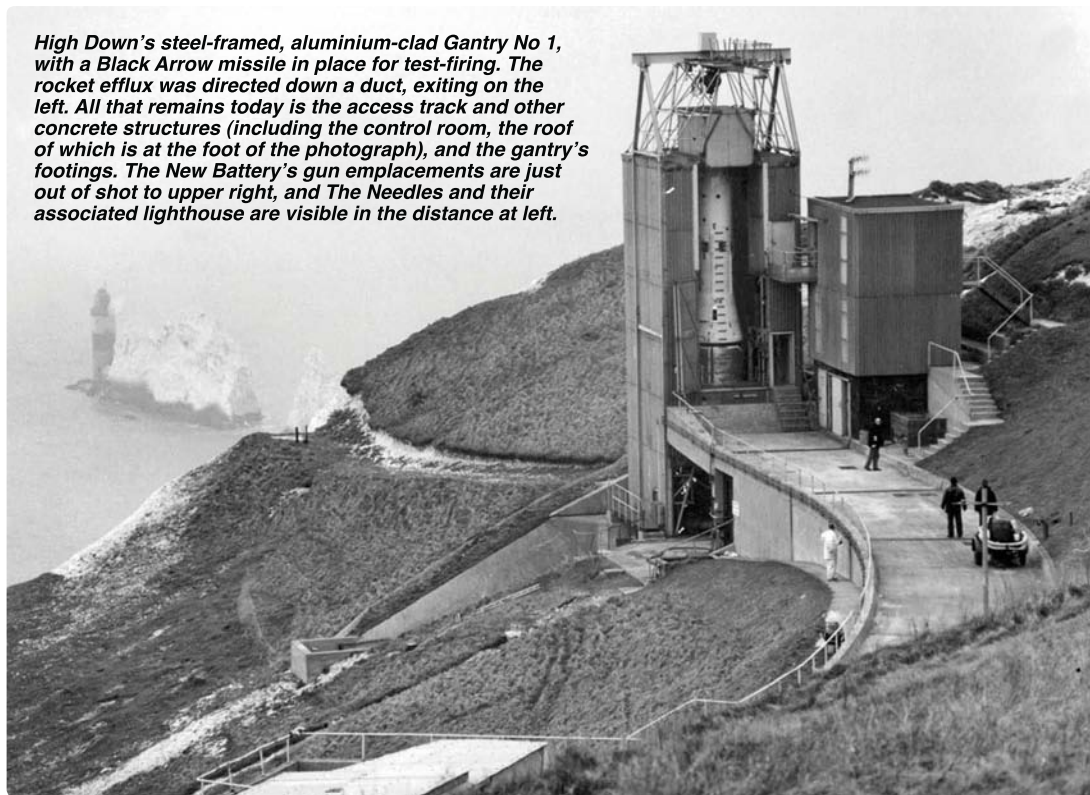
Led by the RAE's Guided Weapons Department, the Black Knight programme involved several partner organisations including Saunders-Roe

on design, construction and testing; and Bristol Siddeley Engines on propulsion. A ground-test site was needed, for static test-firings of the rockets before they went to Woomera for live launches. As luck would have it the New Battery, by now disused, was conveniently close to Farnborough, and extremely close to Saunders-Roe at East Cowes. It also had the advantage of being far enough from habitation that noise nuisance or risk of an accident did not threaten the public; and the seaward slope of the downland meant that the site was concealed from any prying eyes, Eastern Bloc or otherwise, on the mainland.

Two rocket test stands were built, one at each end of a concrete service road, with a control room in between. Each test stand comprised a gantry superstructure — used to raise, support and give access to the rocket — above a concrete base which incorporated a lin-thick steel exhaust duct. This curved duct turned the stream of hot downward efflux through 90° and out over the downslope. During firing, the duct was cooled by a torrential supply of water pouring through it at 1,500gal/min (6,800lit/min).

The rocket's Gamma 201 (later 301) motor was fuelled by kerosene and high-test peroxide (a concentrated solution of hydrogen peroxide). The latter is a somewhat unfriendly substance, so

High Down's steel-framed, aluminium-clad Gantry No 1, with a Black Arrow missile in place for test-firing. The rocket efflux was directed down a duct, exiting on the left. All that remains today is the access track and other concrete structures (including the control room, the roof of which is at the foot of the photograph), and the gantry's footings. The New Battery's gun emplacements are just out of shot to upper right, and The Needles and their associated lighthouse are visible in the distance at left.



adjacent to each test stand was a large concrete bath of water into which site personnel could dive in the event of a spillage.

Black Knight test firings began in April 1957, in advance of the first launch at Woomera in September the next year; and all 22 rockets that were fired, ending in 1965, were first tested at High Down.

... TO BLACK ARROW

As the British effort to develop multiple indigenous nuclear weapons began to wind down in the early 1960s, the desirability of an indigenous satellite launcher took centre stage instead. The RAE's Space Department initiated a new rocket, based on Black Knight's technology, under the name Black Arrow. Designed and manufactured in the same East Cowes factory (by then part of Westland Aircraft) as its predecessor, Black Arrow began its testing at High Down in 1965, with a first launch at Woomera in 1968.

With a height of 43ft (13m), Black Arrow had a first-stage diameter of 6ft 7in (2m) — the same as France's Coralie rocket. This match was deliberate, so that Black Arrow could be used instead of Coralie, if desired, as the second stage of the larger Europa rocket. Both were compatible with Blue Streak, Europa's first stage.

Black Arrow reached its apogee, so to speak, on October 28, 1971, when it placed the Prospero satellite into orbit — the first British satellite put into space by a British rocket. The UK thus became the sixth nation in the world to achieve such an all-indigenous feat. By this time, though, the government had announced the cancellation of the Black Arrow programme. In all, four Black Arrows were launched, and the two main propulsion stages of all of them were test-fired at High Down.

NOT SO MUCH HOVER AS PLUMMET

Once the rocket work had come to an end, High Down Test Site became something of a white elephant. It passed into the hands of the British Hovercraft Corporation — which, understandably, had little use for a steeply-sloping site on the brink of a 300ft vertical cliff — and so, in 1974, the facility was closed for good.

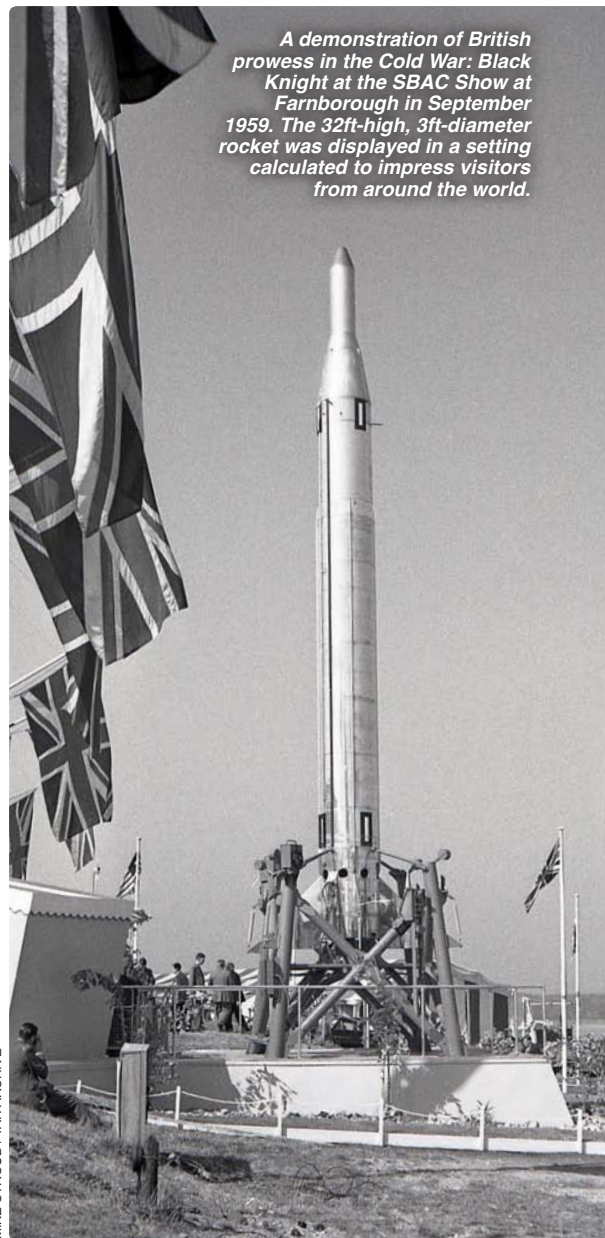
That, then, is the story behind the backdrop behind the Spitfire in our air-to-air photograph. Given High Down's significance in the history of British missile and space rocket development — even though nothing was actually launched from there — it is surprising that it is not better known. A legacy, perhaps, of Cold War secrecy; and of its location, which remains unobtrusive despite its proximity to The Needles, one of the most prominent (in both senses) sights along the South Coast. **MO**



ON THE GROUND . . .

THE HEADLAND CONSTITUTING the High Down Test Site and Needles Battery was bought by the National Trust in 1975, and is now open to the public. The Test Site area is open 1100–1600hr daily from March to October, and there is a small exhibition in one of the underground rooms which includes models of Black Knight and Black Arrow.

■ For more information: www.nationaltrust.org.uk/the-needles-old-battery-and-new-battery



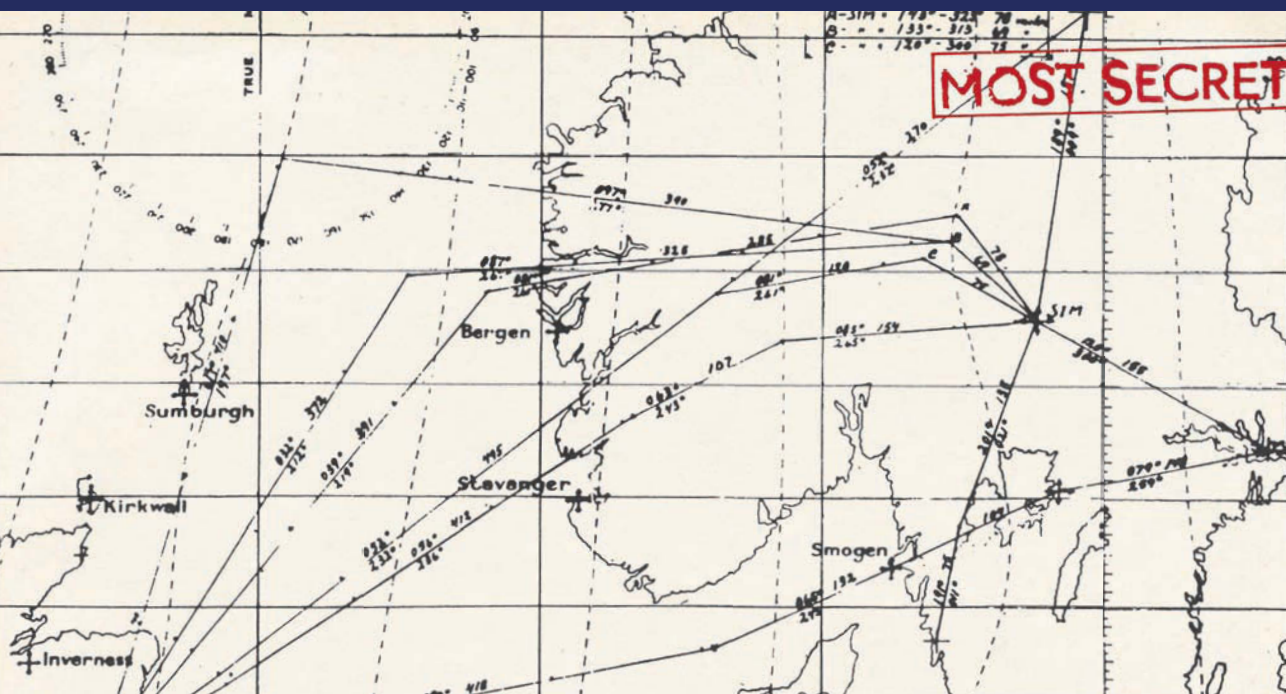
A demonstration of British prowess in the Cold War: Black Knight at the SBAC Show at Farnborough in September 1959. The 32ft-high, 3ft-diameter rocket was displayed in a setting calculated to impress visitors from around the world.

MIKE STROUD / TAH ARCHIVE



THE OTHER STOCKHOLM RUN

BOAC AND NORWAY'S WARTIME
TRANSPORT OPERATIONS





BOAC's use of the Mosquito on the wartime "Stockholm Run" between the UK and neutral Sweden is well-known. What is not, however, is the fact that the same route was also used for a semi-clandestine military transport service operated by Norwegian crews with far more vulnerable aircraft — as Scandinavian aviation specialist **NILS MATHISRUD** explains

FLYING OVER THE southern part of Norway on the nightly flight from Leuchars to Stockholm during the winter of 1944–45, Capt Arvid Piltingsrud decided to detour from his original plan and fly over the family farm that he had left after the German occupation in 1940. He found the right valley between the mountains and, as he approached, could see a lamp shining brightly on the farmhouse wall he knew so well. With memories of his family, to whom he was so close but still unable to be reunited, he continued his flight to Sweden.

The "Stockholm Run", generally better known in Britain as the "Ball Bearing Run", is well known for its operation of civilian de Havilland Mosquitoes on BOAC services between Scotland and Sweden during the Second World War, transporting ball bearings in the bomb bay, as well as the occasional passenger. The Mosquito flights were an important part of BOAC's wartime operations, some 500 of the 1,400-plus landings at Stockholm completed by the Corporation during hostilities being those made by Mosquitoes, despite the scheme having come into being as an improvised solution.

Other aspects of the Stockholm Run are far less well-known, however, including the fact that the civilian BOAC service to Sweden was to a large extent a cover for a Norwegian military operation.

THE ORIGIN OF THE SERVICE

Following the declaration of war on Germany by Britain and France on September 3, 1939, most airline services in Europe were immediately suspended. With London's two major airports at Croydon and Heston considered likely targets for air attacks, the headquarters of British Airways Ltd (BAL) was evacuated to Bristol, with the city's airport at Whitchurch becoming the airline's main landplane base.

British Airways Flight No 730, to Stavanger in Norway, Stockholm in Sweden and Helsinki in Finland, was also suspended, but, as the Nordic countries were as yet unaffected by the war, this route was resumed after two days. The service, commonly known as the Scandinavian Express,

was flown weekly, with scheduled departures from Whitchurch at 0800hr on Mondays, using Lockheed 14 Super Electras G-AFKD, G-AFKE, G-AFMO and G-AFMR.

In October 1939 Flight 730 moved base from Whitchurch to Perth in Scotland. At the same time a stop at Oslo, the Norwegian capital, was added to the route. The leg between Perth and Stavanger (Sola) on Norway's south-west coast was flown by the Lockheed aircraft while BAL's three Junkers Ju 52/3m aircraft — G-AERU, G-AERX and G-AFAP — extended the route via Oslo (Fornebu) to Stockholm (Bromma) and Helsinki (Malmi). Following the Soviet Union's attack on Finland on November 30, 1939, the last leg of Flight 730 was suspended.

On April 1, 1940, BAL and Imperial Airways Ltd were officially combined to form the British Overseas Airways Corporation (BOAC), with the aircraft of the two airlines being formally taken over by the new organisation. Eight days later Denmark and Norway were invaded by German forces during Operation *Weserübung*, and Flight 730 services were again halted. However, four direct flights to Stockholm, with no stops in Norway, were made before the end of the month, when the service was suspended permanently.

Sweden was now surrounded and isolated from the west. It became of vital importance to the British to maintain a communication link to neutral Sweden, partly to counter German influence on Sweden and partly to maintain supplies of Swedish ball bearings to Britain. The British Air Ministry and BOAC soon entered into discussions, and in July 1940 BOAC established a new direct service between Scotland and Sweden. Initially operating from Perth, the organisation moved to Leuchars in February 1941.

The service was initially operated by three Lockheed Super Electras — G-AFGR, G-AGAV and G-AGBG — the last two being former LOT Polish Airlines aircraft that had been evacuated to Britain in September 1939. From April 1941 G-AGBG, nicknamed "Bashful Gertie, the Terror of the Skagerrak", was the only aircraft operating the service. That July a Lockheed Hudson III, registered G-AGDC and named *Loch Lomond*,

OPPOSITE PAGE, TOP An original painting by **ROGER MIDDLEBROOK** of Lockheed Lodestar G-AGDE, named *Loch Lesja*, over the mountains of Norway while operating with BOAC's Norwegian Detachment. The flights to and from Sweden in the slow and vulnerable Lodestars were always made at night and often in appalling weather.

Lockheed 14WF62 Super Electra G-AFMO (c/n 1490) parked near the Airwork hangar at Heston in April 1939. This aircraft was used by British Airways on the Scandinavian Express — Flight 730 — between Whitchurch and Helsinki via Stavanger and Stockholm the same year, but was destroyed in a landing accident at Heston in January 1940.

PHILIP JARRETT COLLECTION



was lent by the RAF for the service. Eventually, a variety of types would operate on the route during the war, including Armstrong Whitworth Whitleys, de Havilland Mosquitoes, Douglas Dakotas, Consolidated Liberators and a single example each of the Curtiss CW-20, Avro York and Lancaster. Norwegian Lockheed Lodestars also made a significant contribution to the service.

THE NORWEGIAN DETACHMENT

Occupied by Germany, Norway was fortunate to share a long border with neutral Sweden. After the German invasion the Norwegian government had managed to flee to Britain to establish a government-in-exile in London. Other Norwegian civil servants fled to Sweden, along with many individuals who were determined to continue the fight. Eventually many members of the resistance who had been involved in illegal activities were forced to leave the country.

The Norwegians thus had a great demand for a transport service between Britain and Sweden. The exiled government's executive branch needed to travel between Britain and Sweden to stay in touch with exiled Norwegians and members of the resistance, while Norwegian refugees in Sweden aimed to join the Allied forces in Britain or work on Norwegian merchant ships all over the world. Travel by air was the quickest option — and, after Germany's invasion of the Soviet Union in June 1941, the only option. Seats on the BOAC service were, however, very limited. The Norwegian authorities in London thus decided to establish a dedicated Norwegian air service between Britain and Sweden.

It initially proved difficult to acquire aircraft

for the new service, as Air Ministry requests were given first priority. Eventually, through the involvement of Crown Prince Olav and the Norwegian military attaché in Washington DC and even President Roosevelt, two Lockheed 18 Lodestars were made available for purchase by the Norwegians in April 1941, the two aircraft arriving in Britain that June. However, the Norwegians could not just establish a military air service between two foreign countries — one of which was at war — on their own. Furthermore, a civilian air service would require a route concession, which the Norwegians did not have.

To overcome these problems the British authorities agreed that the Norwegian service could be operated within the existing BOAC concession and that it could use the Corporation's organisational infrastructure in Stockholm. With the Norwegians lacking the requisite technical and administrative resources to run an airline service, it made sense to use existing British logistics. A special Royal Norwegian Air Force (RNoAF) flight subordinated to BOAC was thus established at Leuchars in August 1941. Command of the unit was given to the senior Norwegian officer, Capt Finn Lambrechts. Within BOAC the unit was referred to as the Norwegian Detachment. The unit's aircraft were also completely subordinated to BOAC operational control.

According to the agreement, the Norwegian Lodestars would be leased to BOAC for operations on the latter's Leuchars—Stockholm service. The Corporation would pay all expenses including wages to the Norwegian personnel. The annual leasing cost to BOAC was to be £2,250 per aircraft. The Corporation and the Norwegian



IAN MÜLLER VIA AUTHOR



LEFT Lockheed 18-10 Lodestar c/n 2087 was one of the two acquired by the Royal Norwegian Air Force in the early summer of 1941 and immediately leased to BOAC. Given the British registration G-AGDD and named Loch Losna, the aircraft was in service with BOAC by the end of July and made its first flight to Stockholm as part of the company's Norwegian Detachment on August 18, 1941.

authorities should each have at their disposal half the available seats for each flight on the route. The Norwegian authorities were to pay £35 0s 0d for each passenger seat used in a British aircraft, while the British would pay £25 0s 0d for each passenger seat used in a Norwegian aircraft.

Tickets for Norwegian passengers were issued by the Norwegian Legation in Stockholm and the Norwegian Government in London, while the British priorities were settled by the Ministry of Economic Warfare and the Air Ministry. The Norwegians were not interested in freight capacity other than mail.

The Norwegian flight crews selected for the service were former commercial pilots and navigators then flying with the Norwegian squadrons in the RAF. The men were formally drawn from military service and were employed as civilian personnel by BOAC. They were given UK passports, which stated they were "British by birth", in order to avoid complications with the

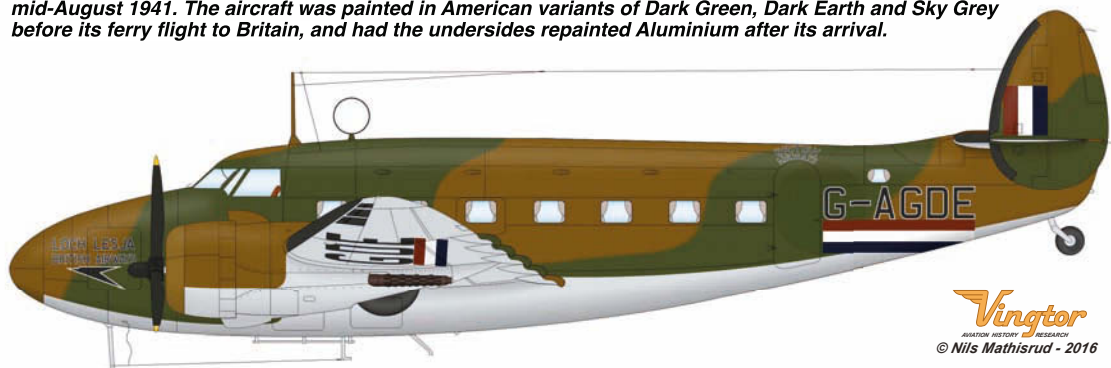
Swedish authorities in Stockholm. As civilians they could not use the RAF barracks at Leuchars, but instead had to arrange private housing in nearby St Andrews. They did, however, retain their Royal Norwegian Air Force uniforms, which they wore while in Britain.

The Norwegian aircraft were allocated British civilian registrations and painted with British Airways titles and the BOAC Speedbird insignia. To comply with the BOAC L-Class tradition of naming its Lockheed 10s, 14s and 18s after Scottish lakes, the two new Lodestars were given the names of Norwegian lakes, G-AGDD becoming *Loch Losna* and G-AGDE *Loch Lesja*.

INTO THE NIGHT

The first of the Norwegian Detachment's flights to Stockholm took off on the night of August 18, 1941, with G-AGDD being flown by Capt Lambrechts and Lt Erik Engnæs. Another flight was made two days later with G-AGDE, after

Lockheed 18-08 G-AGDE Loch Lesja (c/n 2086) operated as part of the Norwegian Detachment from mid-August 1941. The aircraft was painted in American variants of Dark Green, Dark Earth and Sky Grey before its ferry flight to Britain, and had the undersides repainted Aluminium after its arrival.



Vingtor
AVIATION HISTORY RESEARCH
© Nils Mathisrud - 2016



which Lambrechts was reassigned to Woodhaven, near Leuchars, to command the newly-established RNoAF Consolidated Catalina flight. Leadership of the Norwegian Detachment was thus passed on to Engnæs, who was promoted Captain, and who would go on to play a significant role at the unit over the following 18 months.

As the war drew on, the Norwegians acquired more aircraft, the first being a pair of Lockheed 18-40 Lodestars, G-AGEI *Loch Loen* and G-AGEJ *Loch Lange*, in the summer of 1942. In June and September 1943 four Lockheed 18-56s were delivered, with four more of the same type arriving that December. These last eight were standard USAAF C-60As acquired through Lend-Lease and were not given names. Finally, seven Douglas C-47 Skytrains and three Douglas C-53 Skytroopers were acquired in 1945, but were delivered too late to see operation on the Stockholm Run. Norwegian crews also flew BOAC Hudsons and Mosquitoes on the route.

The Swedes also established their own service to Britain, operated by DC-3s of AB Aerotransport (ABA), the first flight of which was completed on February 16, 1942. All flights on the services, British, Norwegian and Swedish, were undertaken at night and in poor visibility. The cover of darkness and cloud was the only defensive measure the unarmed aircraft could use. The flights were flown in total radio silence so as not to reveal the location of the aircraft, and were initially flown along a trajectory over the Skagerrak, crossing the Swedish coastline near Smögen, the only entry/exit point approved by Swedish authorities.

On the night of June 21–22, 1942, a Swedish DC-3 was attacked by a German fighter over the Skagerrak during a flight to Scotland. The transport escaped with nobody aboard hurt, but

ABOVE Lodestar G-AGEI (c/n 2084), named *Loch Loen*, was acquired by the Norwegian government-in-exile under Lend-Lease arrangements in June 1942. By the end of the month it had been taken on strength with BOAC's Norwegian Detachment, and by mid-September 1942 it had begun operating from Leuchars, where it is seen here in late 1943 or 1944.

several bullet-holes were found in the fuselage and wings. The following night BOAC suffered its first loss on its Sweden—UK service. Hudson G-AGDF, with a Norwegian crew and seven passengers, was cruising at 22,000ft (6,700m) above the Skagerrak heading for Scotland when the port engine failed. Captain Engnæs decided to turn around and return to Bromma. Shortly afterwards the starboard engine also began to run rough. The Hudson was within reach of the Swedish coast but the terrain was such that Engnæs chose to ditch rather than try and put down on land. He selected Gullmarsfjorden, a fjord near Smögen and Lysekil, north of Gothenburg. The crew and passengers were rescued before the aircraft sank.

After these incidents, both BOAC and ABA suspended their operations for the summer. However, the lack of an air bridge was unsatisfactory to the British and Norwegians. The British sent an unmarked RAF Mosquito, B.IV DK301, to Bromma on an urgent mission in early August, while the Norwegians resumed their flights with Hudsons and Lodestars.

Although the latter types provided good passenger and cargo-carrying capabilities, along with the Whitleys and a single Curtiss CW-20 that had been introduced on the service, all lacked the performance necessary to evade German flak and fighters. Thus a request for a high-speed high-altitude aircraft was put forward. The service required an aircraft with greater



LEFT *When in Rome — or in this case St Andrews; Norwegian crewmembers enjoy a round of golf during a break from flying. From left: Nils Steen; Arvid Piltingsrud; Helge Bjørneby; John Strandrud; Erik Engnæs; Martin Hamre and Oddvar Wenger.*

ANNIE HEGGSTAD COLLECTION

BELOW *Hatfield-built de Havilland Mosquito FB.VI G-AGGH (formerly HJ723 in RAF service) in BOAC markings at Torslanda airport at Gothenburg in 1944. Note the British Civil Air Ensign flying from the flagpole in front of the terminal.*

speed, ceiling and endurance so that the route over enemy territory could be altered, allowing for the possibility of flying north of Trondheim in good weather conditions. The only type that could meet these requirements was the Mosquito, so BOAC pressed for examples to be released to the Corporation. Following the successful flight of DK301 in August, Mosquito PR.IV DZ411 was delivered to BOAC on December 15, 1942, and given the civilian registration G-AGFV. More Mosquitoes followed, all of the FB.VI variant.

REORGANISATION

In the late spring of 1943 BOAC suspended the Hudson and Lodestar services to Sweden during the light summer period and continued only with the Mosquito. The development of German radar installations along the Danish and Norwegian coastlines, and the increasing number of nightfighters in the area, had made operations difficult for the slower Lockheed aircraft. Although Mosquitoes were also operated by the Norwegian Detachment, the latter had a greater requirement for passenger seats than cargo capability, and the sole passenger that

could be carried in the bomb bay of a Mosquito fell far short of Norwegian needs.

Norwegian Lodestar and Hudson operations resumed in August 1943. Friction between the British and Norwegian organisational groups at Leuchars soon developed, however. The British accused the Norwegian crews of being inefficient and not keeping to the rules laid down by the British. The Norwegians were also accused of cowardice and putting their own safety before operational demands. The British air attaché in Stockholm, Gp Capt Dick Maycock, asked if nothing could be done about “four aircraft and four crews sitting on their backsides in ideal flying weather waiting for cloud cover”. For the Norwegian crews, “ideal flying weather” was something quite different. They preferred cloud cover no higher than they could fly above, and thick enough to hide in should the need arise to evade prowling German nightfighters.

Conversely, the Norwegian crews accused the BOAC ground service at Leuchars of poor organisation. These wildly opposing views on operational matters eventually led to a breakdown between the British and Norwegians, and

HÅKAN ANDERSSON COLLECTION VIA AUTHOR





ABOVE One of the eight C-60A Lodestars acquired by the Norwegians during the latter half of 1943. It may be c/n 2594, which went on to serve on the Stockholm Run as G-AGIK. It is seen here from the cockpit of G-AGDD, still in its delivery colours while on a domestic UK flight. **RIGHT** King Haakon VII of Norway, resident in London from June 1940 to June 1945, in the cockpit of a BOAC Lodestar, probably during a visit to Leuchars on May 7, 1943. EINAR GARNES VIA AUTHOR



the existing agreement on route co-operation between BOAC and the RNoAF was terminated on October 16, 1943. Instead, the Norwegian operations at Leuchars were placed under the direct responsibility of the RNoAF.

On November 19 that year a new organisation — the *Norges Luftfartstyre* (Royal Norwegian Air Transport, RNAT) — was established. Its main purpose was to prepare for Norwegian civilian air operations after the war, but also to administrate airline matters during the war. A new agreement with the British stated that the Lodestar flights could be resumed by the end of November, under the responsibility of RNAT. The Norwegian aircraft were to be operated under a “time-and-line” agreement between BOAC and the Norwegian government-in-exile. The flights would still be operated on the Corporation’s route concession and under the “disguise” of a BOAC operation.

An alternative route was suggested by the Norwegian pilots in order to counter the increased German threat of radar and nightfighters. By crossing the southern Norwegian mainland instead of the Skagerrak, they would encounter enemy radar only when crossing the coastline somewhere over western Norway, and would benefit from their knowledge of local geography

by flying low along the valleys. This change of route would have to be approved by the British Air Ministry, and likewise the Swedes would have to approve a new entry and exit point on the Sweden/Norway border and establish a new air corridor between that point and Stockholm.

DOWN ON THE DECK

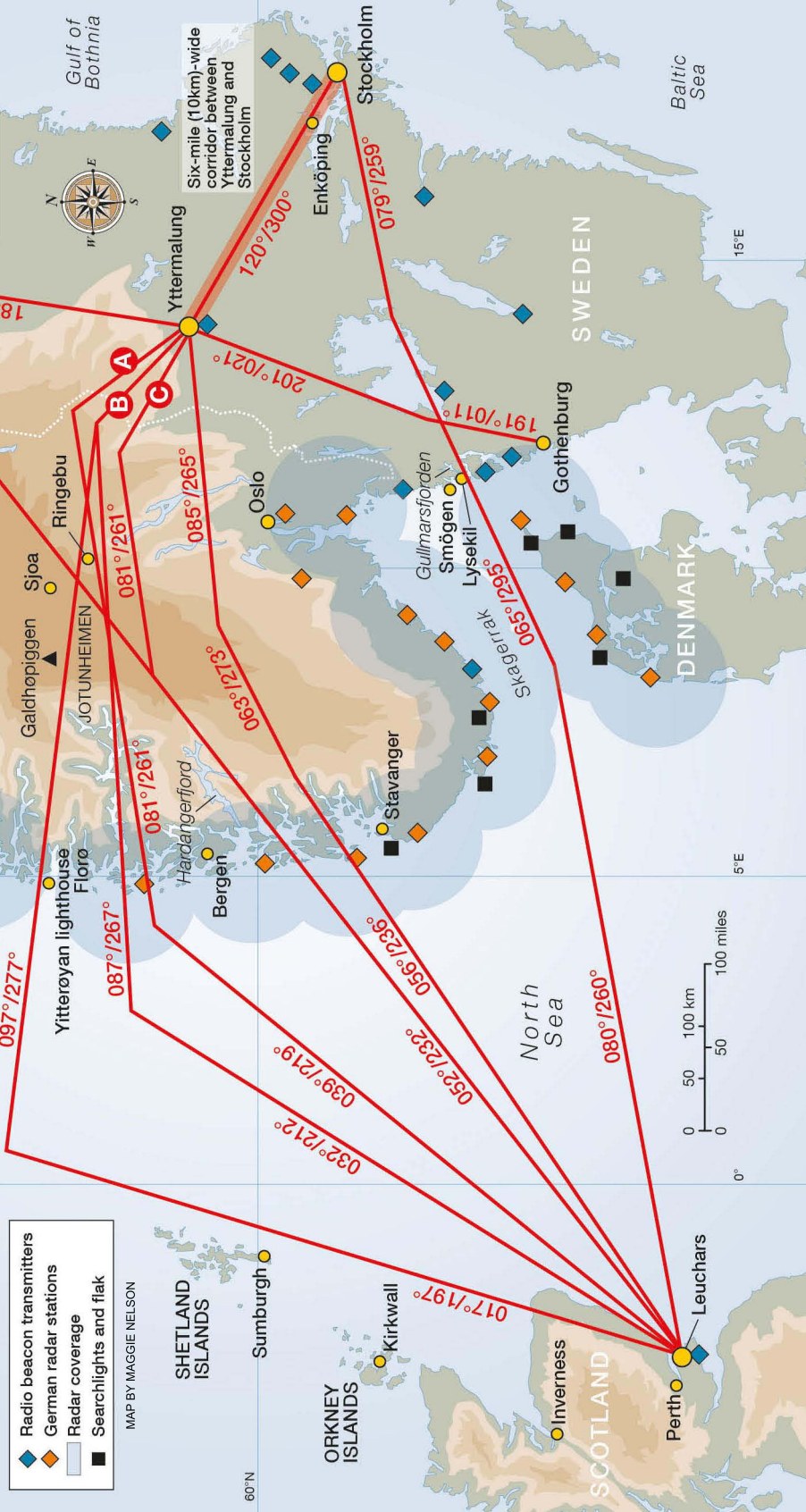
Pilot Major Finn Thorsager later recalled that he most frequently crossed the Norwegian coastline somewhere between Stavanger and Bergen:

“We knew the Norwegian terrain like our own pockets, and we just had to keep away from certain places where we knew there was anti-aircraft artillery. In moonlight during the winter months it was lovely to see familiar locations from the air.”

However, clear skies and moonlight brought other problems, as Thorsager explains:

“In such weather I was more comfortable when I increased the speed to maximum and decreased

In August 1941 BOAC's Norwegian Detachment began services from Leuchars to Stockholm. The routes used by the Detachment, and later Royal Norwegian Air Transport from November 1943, are shown here, based on a contemporary "Most Secret" map. Bearings outbound from Leuchars are shown along the routes, followed by the reciprocal heading for the return flight, i.e. 017° (outbound) / 197° (inbound).





the altitude to minimum to avoid German fighters.”

This made it difficult for German radar to detect the intruders, and also practically impossible for the Luftwaffe nightfighters to spot them.

Navigator and radio operator Einar Sverre Pedersen describes one of his flights with Capt Alf Hiorth at the controls:

“We took off from Leuchars at 1500hr, heading for the Shetlands. At the most northerly of the islands we turned north-east towards Ytterøyen lighthouse off Florø. There was a full moon and a cloudless sky, so Hiorth decided to fly ‘on the deck’ to avoid detection by German radar. The coastline was moonlit when we passed Ytterøyen and headed for the glowing white surface of the Hardangerjøkulen glacier.

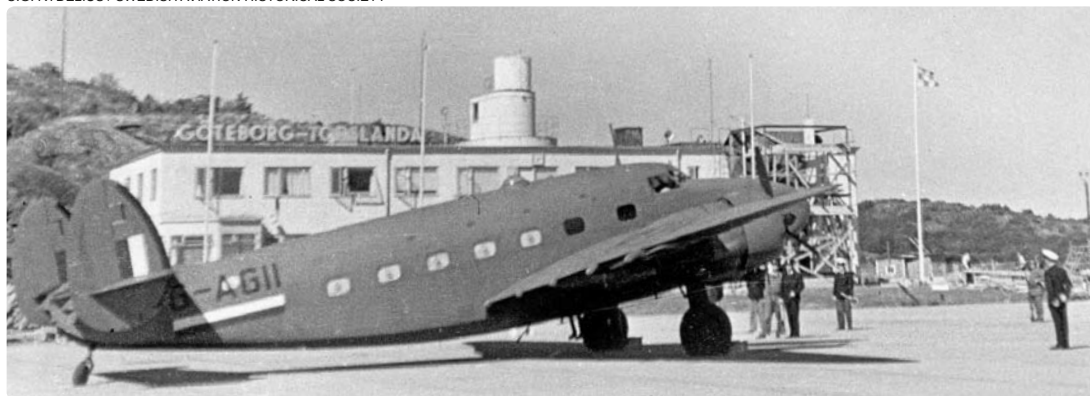
“Hiorth really appreciated this type of flying. I occupied the copilot’s seat, reading the map while keeping an eye on the compass. We were navigating by the terrain and the valleys didn’t

ABOVE Cargo piled up outside the Bromma terminal in Stockholm. It would not have been difficult for foreign agents to find out what was being transported in and out of the Swedish capital. **BELOW** Lockheed C-60A G-AGII (c/n 2492) was used by Royal Norwegian Air Transport on the Sweden service from August 1944, and is seen here at Torslanda on August 15. Note the internal blanking-off of most of the cabin windows.

always head in the same direction we needed to go in. We could soon see the well-known profile of Galdhøpiggen [Norway’s highest mountain] ahead and continued our flight between the many peaks of the Jotunheimen massif.

“It all passed too fast. I would have liked to circle around Jotunheimen to enjoy the view, but the mail in our cargo had to reach Stockholm as soon as possible. We dived down into the Gudbrandsdalen valley at Sjøa. All houses were blacked out, but at a cottage on the eastern side of the valley a beacon was blinking. Possibly the

C.G. RYDELIUS / SWEDISH AVIATION HISTORICAL SOCIETY



Another of the C-60As acquired by the Norwegians under the provisions of Lend-Lease, G-AGIK (c/n 2594) is seen here being refuelled at Bromma in late 1944, having been leased to BOAC at the end of March that year. It was returned to the Royal Norwegian Air Force coded "F" in July 1945, to serve with the newly-formed No 20 Transport Flight.



resistance was awaiting a drop of supplies, or perhaps it was Germans trying to mislead Allied para-drop aircraft.

"At Ringeby we turned south-east, heading for the radio beacon [designated SIM] at Yttermalung in Sweden, where the 10km (six-mile) wide corridor towards Stockholm started. We slowly climbed to 2,000m [6,600ft]. It was no longer necessary to fly at low altitude; the Swedish anti-aircraft artillery only shot at visiting aircraft if they flew outside the corridor.

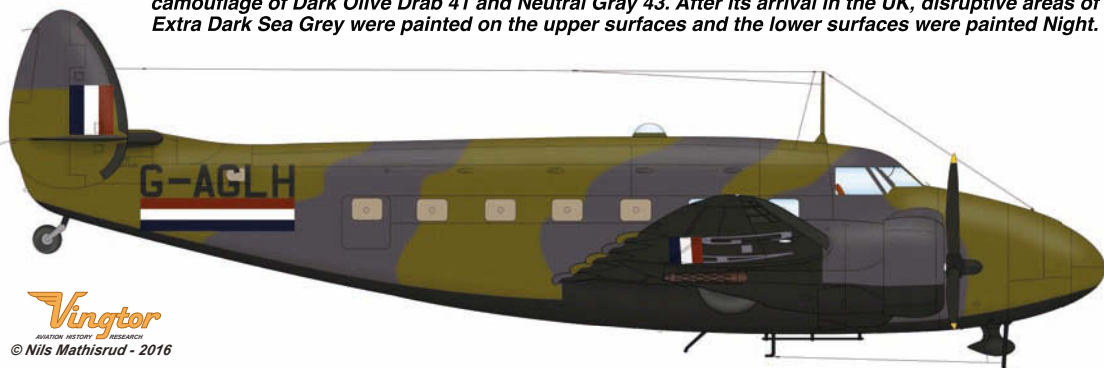
"Below us we could see the lights of hundreds of homes, and the small town of Ludvika shone towards us like a big city. We established radio contact with the Bromma tower at Enköping and started descending. We were almost blinded by the millions of lights of Stockholm at night, so it was nearly impossible to spot the runway, particularly as the runway lights were only switched on as we started the approach."

With the delivery of the eight C-60A Lodestars in late 1942, the unit suddenly found itself with more aircraft than it could operate. From March 1944 Norwegian transport requirements were also met by an American effort, Operation *Balder* (also known as Operation *Sonnie*), in which Norwegian refugees were flown to Britain in four-engined CB-24 Liberators and C-87 Liberator Expresses. Several Lodestars were thus retained in America, operating for a period on a service between Dorval (Montreal) and Nassau in the Bahamas, while others already with RNAT in Scotland were used to fly Norwegian refugees from Leuchars to the Isle of Man, where they were debriefed or interrogated by MI5.

POST-WAR OPERATIONS

Following the German capitulation in May 1945, the Norwegian service moved operations from Stockholm to Oslo. Along with its crews at

Lockheed C-60A G-AGLH (c/n 2616) circa the spring of 1945. It was delivered in standard USAAF camouflage of Dark Olive Drab 41 and Neutral Gray 43. After its arrival in the UK, disruptive areas of Extra Dark Sea Grey were painted on the upper surfaces and the lower surfaces were painted Night.



Vingtor
AVIATION HISTORY RESEARCH
© Nils Mathisrud - 2016



LEFT BOAC shared its base at Leuchars with B Flight of No 333 (Norwegian) Sqn, both enjoying the benefits of co-location, especially regarding ground services. Here Mosquito II DZ744 of No 333 Sqn shares the ramp at Leuchars with BOAC Mosquito VI G-AGGC (formerly HJ680) in late 1943 or early 1944.

BOTTOM Lodestars of No 20 Transport Sqn at Fornebu, Oslo, in the summer of 1945. The unit's designation was reportedly inherited from Luftwaffe transport unit Transportfliegergruppe 20, which operated from Fornebu during the war.

Leuchars, RNAT was militarised and transferred to the RNoAF. As the latter was still under RAF command, the aircraft had their British civilian registrations removed and were painted with combined British and Norwegian military markings. The unit was renamed *Luftforsvarets transportavdeling* (LTA — RNoAF Transport Unit).

The unit continued to operate from Leuchars until, on July 2, 1945, it transferred its Scandinavian base to Oslo's airport at Fornebu and the terminus in Britain was moved from Leuchars to Croydon. The Norwegian ground personnel at Leuchars and Bromma were also transferred to Fornebu. From July 7 the unit was given a new designation, No 20 Transport Flight, later renamed No 20 Transport Squadron.

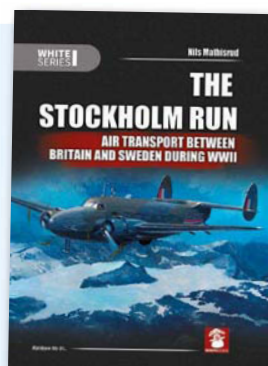
The logbooks for Bromma airport reveal that some 386 Lodestar flights were made to Stockholm during the war. Norwegian crews also flew 43 Hudson and 71 Mosquito flights to the Swedish capital. In addition, there may have been some flights which terminated at Gothenburg. The operation suffered several losses, including a number of attacks by German nightfighters, with one Lodestar presumed shot down. In total, 12 BOAC aircraft were lost on the route: five Norwegian Lodestars, one Norwegian-crewed

Hudson and one Mosquito with a Norwegian crew. A total of 20 crew members — nine British and 11 Norwegian — and 22 passengers were killed operating the Stockholm Run.

After the war, reunited with his family, Arvid Piltingsrud mentioned the episode when he flew over his home farm en route to Stockholm. His mother explained that during the years of occupation, the outdoor lamps were never lit, owing to the enforced blackout. However, she revealed that she made an exception on one single occasion — because somehow she felt it was exactly right that particular night.



NILS MATHISRUUD is the author of the forthcoming definitive tome on the British, Norwegian, American and Swedish wartime flights to and from Sweden. ***The Stockholm Run*** (ISBN 978-8-36528-1-159) is published by MMP Books; for full information visit the website at www.mmpbooks.biz



C. NØRSGAARD VIA NORWEGIAN DEFENCE MUSEUM





Decals for BOAC & RNAT Stockholm Run aircraft



Vingtor Decals
vingtor@vingtor.net – www.vingtor.net



NEW
 from
RAF-in-COMBAT:

ALLIED WINGS No.19
The E.E. Canberra B(I).8

70 pages, 110 photos, 7 colour profiles

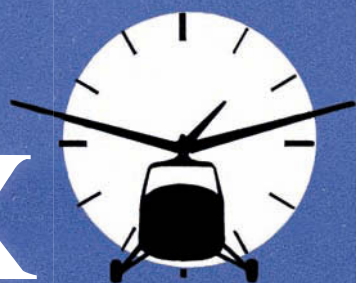


www.RAF-IN-COMBAT.com






An Englishman in New York



NEW YORK AIRWAYS, INC.

— THE FIRST HELICOPTER AIRLINE —

In October 1958 renowned British aviation journalist John Stroud paid a flying visit to the Big Apple, primarily to sample the services of one of the few successful, if still financially precarious, commercial rotary-wing operators then active anywhere in the world. At the time of John's visit New York Airways was in the process of getting to grips with its brand new fleet of tandem-rotor Vertol 44B "flying bananas"



The John Stroud Archive

One of Britain's most respected aviation journalists and authors, John Stroud (born April 3, 1919) joined Imperial Airways aged 14. Six years later he became a freelance aviation writer and in 1963 was appointed General Editor of the definitive Putnam series of aeronautical books. Also a talented photographer, John continued to contribute articles to the British aviation press until his death in March 2007. In 2014 a substantial part of John's archive, including numerous rolls of previously unseen 35mm film, was acquired by A Flying History Ltd and forms the basis of this regular *TAH* series

“Manhattan Island, downtown New York, the United Nations building, the busy bridges flung across the East River and — dominating the towering skyscraper-scape — the Empire State Building; a ride in a New York Airways helicopter offers, in addition to transportation, one of the most wonderful sights in the world . . .”

— Flight, October 1961



ALL PHOTOGRAPHS BY JOHN STROUD UNLESS OTHERWISE STATED

WHEN WELL-TRAVELLED British aviation journalist John Stroud [*no relation!* — Ed] paid a two-night visit to the Big Apple in early October 1958, New York

Airways, the world's first operator of scheduled helicopter passenger services, was in the midst of an important year, having replaced its small and somewhat utilitarian fleet of Sikorsky S-55s and S-58s that April with five state-of-the-art Vertol 44Bs. The tandem twin-rotor Vertol offered — on paper at least — superior economy owing to its larger and more passenger-friendly cabin, and additional safety thanks to the sealed lower fuselage, which would remain watertight in case of a ditching in the numerous waterways encircling Manhattan and its environs.

As one of the USA's pioneers of commercial helicopter passenger operations, New York Airways was very much at the top of John's list of “to-dos” on arrival in the great city, into which he flew on October 10, 1958, from Keflavik in Comet 4 G-APDE. With the airline settling into a new routine with its handsome factory-fresh blue, white and red fleet, John took the opportunity the following day to sample the service from New York's domestic airport at La Guardia to the heliport at West 30th Street

in downtown Manhattan. Thus it was that he boarded Vertol 44B N10104 armed — as always — with his trusty camera and notebook.

AMERICA'S HELICOPTER AIRLINE PIONEERS

Although scheduled commercial rotary-wing services had been inaugurated in America as far back as 1939, when Eastern Air Lines began an experimental mail-carrying service in Philadelphia with a Kellett KD-1B autogyro, the economics of helicopter operations had proven a tough nut to crack. The operating costs of a conventional airliner become more manageable the longer the route stages are, and rocket skyward as the stage distance shortens. Helicopter operations, with the unique advantage of being able to deliver passengers into the heart of the urban fabric — but also with the drawbacks of slow block speeds and comparatively inefficient use of engine power for forward flight — have always been a notorious head-scratcher for potential rotary-wing operators.

One potential solution — and initially the only solution — was the provision of subsidies by means of local or state intervention. Given that helicopter services would never be able to compete with fixed-wing operations on equal

OPPOSITE PAGE, TOP New York Airways' newly-acquired Vertol 44B N10104 (c/n 538) prepares to depart La Guardia Airport for the West 30th Street heliport in downtown Manhattan on October 11, 1958. **THIS PAGE, TOP** The view of the unmistakable New York skyline from the cabin of N10104 during John Stroud's visit in 1958.



ALPHAARCHIVE

ABOVE A superb photograph of Los Angeles Airways' Sikorsky S-51 N1398 (c/n 5103) on a mail service from Los Angeles International Airport, with a TWA Lockheed Constellation as a backdrop. The CAB granted LAA a temporary three-year certificate for local mail services in May 1947, extending it in 1951 to include passengers.

terms, it was felt that their significant time-saving elements would to some extent justify the higher cost. Inevitably, the federal subsidisation of commercial helicopter operations became an unavoidable — and frequently controversial — fact of life during the pioneering years.

Safety was another issue, as urban operations would, by definition, be conducted over densely populated areas by single-engined machines (as the vast majority of helicopters were at that time); an engine failure over such an area would not just be catastrophic for the occupants of the helicopter. Nevertheless, a number of strong-willed optimists were determined to fulfil the community-hopping potential of the helicopter, with United Air Lines establishing a series of mail routes in 1947 between Chicago's Midway Airport and more than 30 local communities, flown by a Sikorsky S-51. Again, the economics fell far short of expectations and the service was terminated not long afterwards.

The same year a temporary three-year certificate was granted for local mail services to all-helicopter operation Los Angeles Airways (LAA), which had been formed by a syndicate of local businessmen in May 1944. On October 1, 1947, the world's first scheduled helicopter mail service was flown by an LAA S-51, the company going on to become one of the world's most successful commercial rotary-wing operators until its demise in the early 1970s.

By 1949 more American urban operators were joining the whirlybird club and in August that

year Helicopter Air Services (HAS — later to become the highly successful Chicago Helicopter Airways) began mail operations in Chicago with a fleet of Bell 47Ds.

With its towering skyline and canyons of steel and glass, New York City was an obvious candidate for a helicopter service, particularly as its domestic and international airports were spread over a large area, with La Guardia (domestic) and Idlewild (international) in Queens to the east and south-east of Manhattan, and Newark (domestic) and Teterboro (general aviation) across the Hudson River in New Jersey. What might take considerably more than an hour by taxi or bus from Idlewild into the heart of Manhattan could be flown by a helicopter in little more than 10min.

SKYBUS INTO BUSINESS

With an eye on this potentially lucrative market, New York Airways Inc (NYA) was established in 1949, and was awarded certification for a scheduled helicopter service by the Civil Aeronautics Board (CAB) after its successful bid for the New York Area Helicopter Case in 1951.

The CAB certificate authorised the carriage of mail, property and passengers, the airline establishing a "clover-leaf" pattern of four circular routes covering outlying suburban areas and providing shuttle services between the major airports. The CAB stipulated, however, that for the first year NYA should focus on the carriage of mail. The company's inaugural



ABOVE Looking somewhat inelegant with the flotation bags required for flight over water with a single-engined helicopter, Sikorsky S-55 N417A (c/n 55-433) awaits another flight at La Guardia. This machine was one of NYA's later arrivals, not being delivered until May 1953. It later went to Canada, where it was re-registered CF-MYZ.

service, a mail flight between La Guardia, Idlewild and Newark, was flown on October 15, 1952, in one of its newly acquired S-55s.

All three of what the CAB designated the Helicopter Carriers — LAA, HAS and NYA — were operating under heavy federal subsidy, although only NYA was equipped with machines large enough to carry a meaningful passenger load; when loaded with mail and cargo, LAA's four-seat S-51s and HAS's Bell 47D two-seaters had room for only the pilot and maybe one passenger. The S-55s of NYA, however, could carry mail and passengers, although one had to be traded against the other. On July 8, 1953, NYA began passenger services between the three

major airports, with limited suburban passenger services to destinations in New Jersey, New York state and Connecticut following in 1954.

Also in 1954, over on the West Coast, LAA started passenger services with a fleet of S-55s from Los Angeles International Airport to the heliport at Long Beach, and in November 1956 HAS, also with S-55s by this time, inaugurated passenger flights between Chicago's major airports — Midway and O'Hare — and the heliport at downtown Meigs Field.

In the meantime, commercial helicopter services had gained a foothold in Europe, with Belgian airline Sabena opening the world's first international scheduled helicopter passenger

BELOW Without flotation bags but looking only slightly less ungainly, S-55 N406A undergoes a cockpit check at La Guardia. This example was one of NYA's original batch of S-55s, delivered in late October 1952. The company was keen to promote its "Skybus" concept, hence the inclusion of the chevron logo beneath the cabin windows.





ABOVE In August 1956 NYA received its first Sikorsky S-58, N876, seen here, the other three arriving between September 1956 and January 1957. The S-58 offered better economics than the S-55 but was still rather utilitarian. **BELOW** An NYA Vertol 44B beside the modest terminal at the twin-platform West 30th Street heliport in 1958.

service, from Brussels to Rotterdam in the Netherlands via Lille in France, in September 1953 (see *Sabena's Cityhoppers* in TAH7). In Britain BEA started its loss-making and short-lived South Bank—Heathrow service in July 1955 (see *The South Bank Show* in TAH13), both international airlines using S-55s on the heavily subsidised services. Indeed, it was calculated at the time that rotary-wing aircraft were between 15 and 25 times more expensive to run than their fixed-wing counterparts.

The three American scheduled helicopter operators were essentially being kept alive by generous mail rates averaging \$30 per ton-mile; to lend some perspective, the domestic trunk carriers were receiving around 37c per ton-mile, with the Local Service Carriers getting \$1.53 per ton-mile — no wonder the CAB's subsidy for helicopter services in the financial year 1958

was a colossal \$4.5m. Nevertheless, by 1957 the Helicopter Carriers' passenger traffic had increased by 118 per cent over the course of the year, with freight up by 114 per cent. In July 1957 alone NYA carried 9,100 passengers in its fleet of nine helicopters — it had by this time acquired four S-58s to supplement its five S-55s — and hauled some 60,000lb (27,200kg) of freight and 250,000lb (115,000kg) of mail.

With NYA's suburban and airport shuttle services operating satisfactorily (with some of the suburban services having been dropped after 18 months or so in an attempt to carve down expenses and live within the available subsidy grant), it was proposed that a heliport be constructed at a site on the west side of Manhattan, into which helicopters could operate from the major airports. The city's Port Authority was, happily for NYA, a firm believer





ABOVE *New York Airways' decision to re-equip with the Vertol 44B in 1958 was in part influenced by the airline's desire to get away from the somewhat agricultural feel of the S-55 and S-58 and offer its passengers an experience more in line with those they were used to on fixed-wing airliners. Note the clamshell rear door with inbuilt steps.*

in the helicopter, and on September 26, 1956, the West 30th Street heliport opened for business, NYA commencing operations into the two-platform site from that December.

The airline was still keen to find a way of reducing its subsidy, or ideally operating without it altogether, and towards the end of 1957 began casting around for a helicopter that would improve the company's profitability. In the December 16, 1957, issue of American news periodical *Aviation Week* a report stated that NYA was "considering a switch from Sikorsky to the Vertol 44 [which has] a watertight fuselage bottom and three inflatable floats for the Manhattan heliport operation".

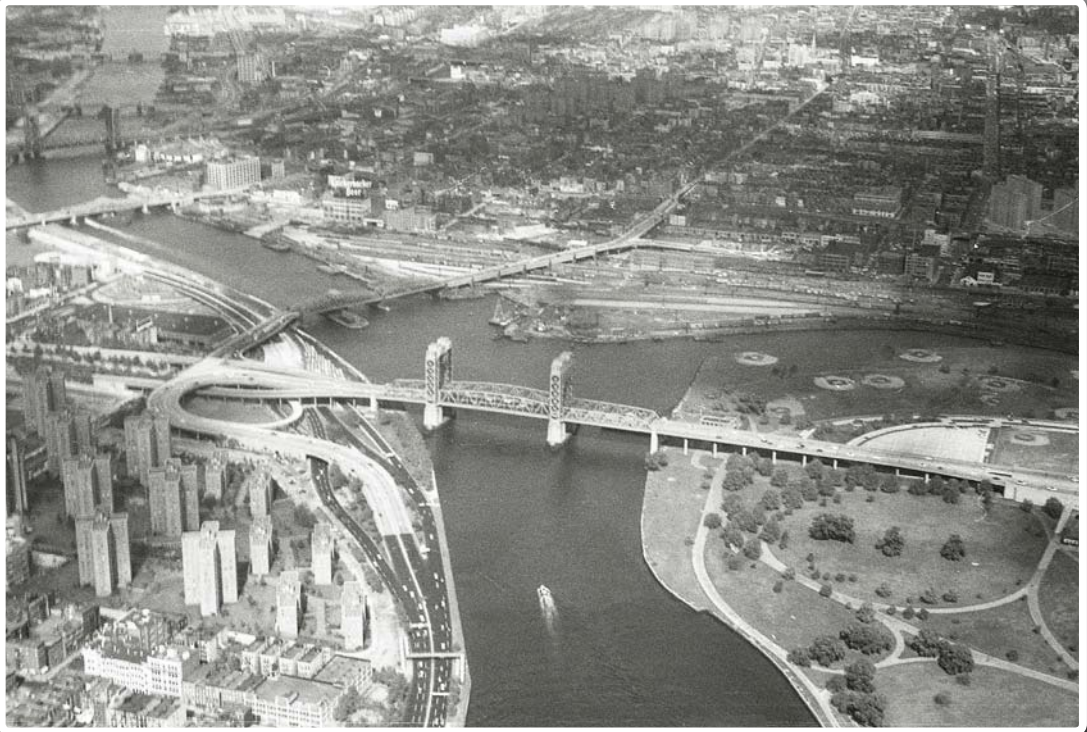
The report continued: "The plan calls for the purchase of five 15-passenger 44Bs with spares at a price of about \$2m. NYA would dispose of its present fleet of four S-58s and five S-55s to another operator; negotiations for the sale are under way."

ENTER THE FLYING BANANA

When helicopter pioneer Frank Piasecki left his eponymous company (Piasecki Helicopter Corp) in March 1956 to set up the similarly named Piasecki Aircraft Corp, the former firm rebranded as the Vertol Aircraft Corporation and continued to manufacture its highly successful series of rotary-wing aircraft, which included the military H-21 Work Horse/Shawnee, then in service with the USAF, US Army, Royal Canadian Air Force, France's *Aéronavale*, West Germany, Japan and Sweden. Powered by a single nine-cylinder 1,150 h.p. Wright R-1820-103 Cyclone engine driving a pair of tandem, fully articulated three-bladed counter-rotating rotors,



ABOVE *The Vertol 44s acquired by NYA and the Swedish Navy were fitted with a watertight lower fuselage and three rubberised-fabric floats mounted above the wheels as part of the undercarriage, to allow emergency alighting and take-off from water. Touchdown on the water could be made safely at forward speeds of up to 30 m.p.h. (48km/h), and the 44 could taxi through water at up to 10 m.p.h. (16km/h).*



ABOVE John Stroud's flight from La Guardia to the West 30th Street heliport followed the usual route, passing over Randalls Island to the east of Manhattan, offering splendid views of the Harlem River Lift Span, part of the Triborough Bridge complex, as seen in the centre of this photograph. Next stop, downtown Manhattan . . .

BELOW Vertol 44B N10104 taxis out for another of its short hops between Manhattan and the New York City airports. Interestingly, the helicopter's fuselage is adorned with the distinctive star logo of the Brussels Expo '58 exhibition held that year in Belgium, during which Belgian national airline Sabena leased one of NYA's Vertol 44s, N74057, to help with increased helicopter traffic to and from the exhibition site. Why N10104 also had the logo painted on its fuselage remains something of a mystery.





ABOVE *Lifting off from La Guardia, N10104 dips its nose as it makes the transition to forward flight. There was much talk about NYA acquiring Fairey Rotodynes in the early 1960s, but with average stage lengths of only 12 miles (19km) NYA justifiably felt that the Rotodyne would be too big and too fast to operate economically on its intra-city routes.*

the H-21 quickly acquired the nickname “flying banana” owing to the distinctive upward angle of its aft fuselage. The prototype made its first flight in April 1952.

Following the H-21’s success in its military roles, Vertol began work on a civil variant, which incorporated all-metal rotor blades, a number of aerodynamic refinements and the introduction of a roll-rate-damper stability mechanism to improve the helicopter’s flying characteristics. Three civil variants were offered by Vertol; the Model 44A for utility passenger and cargo work; the 44B for commercial passenger services, with room for 15 seats plus cargo and mail, and the 44C deluxe executive transport.

The Model 44B was granted its CAA Type Certificate in April 1957 and was offered in airline configuration for a unit price of \$290,000, the soundproofed main cabin incorporating a two-piece clamshell main door on the port side, and a cargo hold in the rear fuselage for baggage and mail. The engine was upgraded to a 1,425 h.p. Wright 977C9-HD1, with a maximum cruising output of 900 h.p. at 2,500 r.p.m.

In late January 1958 NYA confirmed the purchase of five Vertol 44Bs, with delivery scheduled for April that year. As per the plan, the S-55s and S-58s were sold off, with NYA forecasts predicting that the new machines would double the company’s annual seat-

mile capacity from 2.5 million to 5 million. Nevertheless, the airline still required a \$1m loan from the CAB to secure the new fleet. Interestingly, a February 1958 report in *Flight* stated that NYA planned to “replace the Vertol 44s — which they describe as ‘interim vehicles’ — with 40–50-seat twin-turbine aircraft in the early 1960s”. Clearly the shortest-haul company in the USA was in it for the long haul.

The flying bananas duly entered service in the spring of 1958, and within a year had increased NYA’s passenger traffic by a considerable margin. Each flying an average of just over 119 flying hours per month, the Vertols flew a total of 55,266 fare-paying passengers and more than 1,000 tons of freight and mail over the company’s routes in the six-month period between December 1958 and May 1959.

BANANA OVER THE APPLE

By the time of John Stroud’s visit to NYA in October 1958 the Vertols had been “de-bugged”, presenting no more operational problems than the previous Sikorsky fleet. The new machines were averaging about 4hr flying time per day, much the same as the S-55s and S-58s they had replaced, the only significant issue encountered with the 44Bs being a problem with the clutch, which had not been designed with NYA’s high number of engagements per hour in mind. The



ABOVE Taken during his Vertol flight with pilot Jack Compton at the controls, John Stroud's photos show the superb sightseeing opportunities the service provided. The left photo shows the celebrated Manhattan skyline from above the Hudson River; the photo on the right was taken passing over the north-western tip of Central Park.

company accordingly set to work to resolve the issue and NYA's engineers devised a solution which gave the clutch an indefinite life.

The airline's pilots quickly took to the new helicopter, although according to the company's chief engineer, Jack Gallagher, the roll-rate damper caused some consternation until the pilots became accustomed to it. Gallagher also explained at the time that "because of its heavier gross weight, the Vertol requires more flying from its pilots until they learn its advantages — better hovering characteristics, more controllability and less crosswind effect".

The new fleet's routes were essentially the same as those performed by the Sikorsks, and, although no account of John's flight from La Guardia to the West 30th Street heliport appears to have been published at the time, it was similar to a trip made by *Flight* journalist J.M. (Mike) Ramsden in an S-58 in December 1956, in which he flew in the opposite direction, from the heliport to La Guardia. His characteristically enjoyable report gives a flavour of the short hop across Manhattan:

"We lifted smartly off the heliport and swung over the Hudson River. From the right-hand windows we beheld Manhattan in all its many-storeyed magnificence as we flew parallel to the west side of the island as far as 96th Street. Here

we turned sharp right on course for La Guardia across Central Park (which is not, as I was vaguely surprised to find, as green as the maps make it out to be)."

The route from the heliport followed the river northwards until the helicopter was level with the northern tip of the park, within which was a designated emergency landing site, before turning east to cross the park and continue over the Harlem River and Randalls Island to La Guardia. Weather minima for the Vertol 44s were 1,000ft (300m) and three miles, with the minimum cruising height varying between 700ft (210m) and 1,500ft (450m), although Decca Navigator equipment was fitted to the Vertols for Instrument Flight Rules (IFR) trials during 1959–60. Mike Ramsden's flight was concluded in short order:

"Within 10min of leaving the heliport we had descended upon the La Guardia apron — jam-packed, as always, with just about every make of transport aeroplane in America."

The Vertols continued to provide sterling service for NYA, although the fleet was grounded very briefly in September 1959 when modifications to the engine cooling-fan assembly became necessary after a fan failure occurred in one of the 44s just before an afternoon take-off from La Guardia. Working through the night

The standard one-way fare from La Guardia to the West 30th Street heliport in 1959 was \$5, Idlewild to the heliport being \$2 more. The first flight of the morning was the 0626hr flight from La Guardia to West 30th Street and on to Newark, and the last flight of the night on a weekday arrived at Newark at 2318hr.



RIGHT New York Airways' brochures and timetables were used to emphasise the company's claim to fame as "The First Helicopter Airline". VIA DAVID H. STRINGER


the airline had two of the Vertols back in service the next morning, the third by noon and the remaining two by late afternoon.

FROM PISTON TO TURBINE

By late 1958 NYA was already some way into its search for a twin-turbine-powered helicopter to replace the single piston-engined 44s and was in discussions with Vertol about the latter's Model 107, powered by a pair of Lycoming T53 gas-turbines, which had made its maiden flight on April 22 that year. In January 1960 NYA placed an order for ten Vertol 107s (later amended to five), which, after a number of delivery delays, entered NYA service on July 1, 1962.

Having sampled the delights of NYA's pioneering helicopter service, John Stroud spent the rest of his New York visit sightseeing and taking photographs of Central Park, before heading back to the UK the following day aboard Boeing Stratocruiser G-AKGJ, piloted by one Capt Norman Tebbit. John was clearly a fan of the NYA operation, returning to fly in Vertol 44B N10102 in April 1960 — same route (La Guardia—West 30th Street) — and again in 1971, when he photographed the company's Sikorsky S-61s, which had replaced the 107s the previous year, at John F. Kennedy Airport (as Idlewild was renamed in 1963).

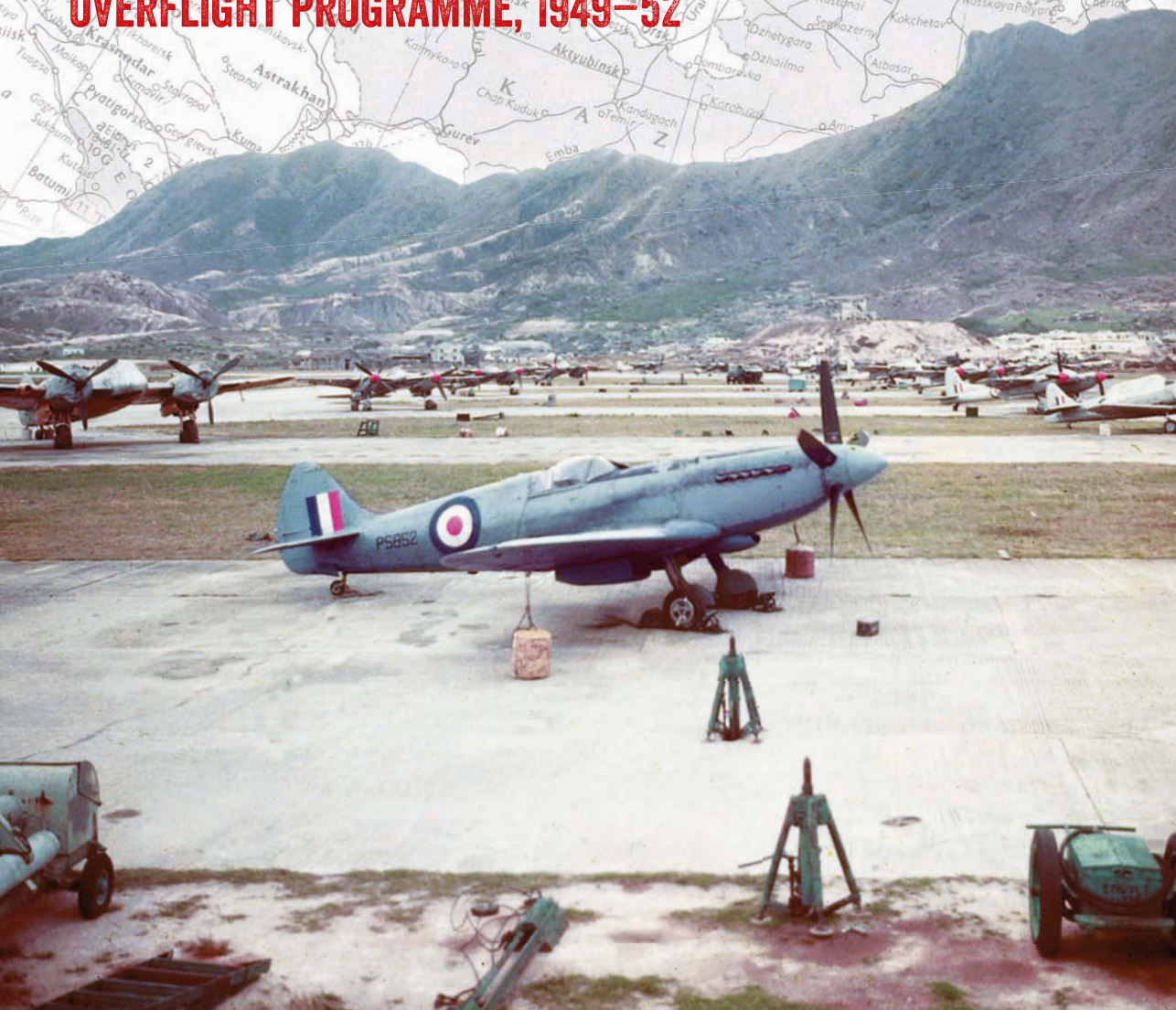


Although the helicopter offered sensational sightseeing opportunities over one of the most spectacular cities on earth, maintaining a scheduled rotary-wing passenger service proved extremely challenging. Nevertheless, NYA clocked up an impressive three decades of helicopter services before finally calling it a day after an S-61 accident at Newark in April 1979, the company filing for bankruptcy and closing for business shortly afterwards. **NS** 

ACKNOWLEDGMENTS The Editor would like to thank David H. Stringer, Mike Ramsden, and Colin Higgs and Jo Ware at A Flying History Ltd (www.flyinghistory.com), for their invaluable help with this feature

SPIES IN COLD WAR SKIES

THE WEST'S STRATEGIC RECONNAISSANCE
OVERFLIGHT PROGRAMME, 1949–52





As the uneasy peace of the immediate post-war period hardened into political battle-lines drawn between the communist East and capitalist West, accurate information on the enemy's strength and disposition became crucial. Using official documents and first-hand accounts from British and American pilots, **DOUG GORDON** examines the West's early series of forays deep into hostile territory

STRATEGIC RECONNAISSANCE is defined as gathering intelligence in order to discover the enemy's overall disposition, strength and level of technology — in other words, its ability to wage war on a global scale. It is used to find and pinpoint targets for international warfare and identify indications of a surprise attack. In this it differs from tactical reconnaissance, which is designed to gather intelligence about the enemy's disposition, strength and technology on the battlefield and its environs.

Two of the strategic reconnaissance methods by which the USA and its allies sought to gather intelligence from the earliest days of the Cold War were overflights and PARPRO flights. The former involved violating the territorial integrity of other countries' airspace by overflying them without their consent, with the specific intention of gathering intelligence which could be used in the event of war. PARPRO (Peacetime Airborne Reconnaissance Program) flights did not involve overflying the territory of another nation, but by flying along the borders of an opposing nation and collecting data by electronic or photographic means.

At the end of the Second World War the world was divided into two opposing political camps. On one hand was the USA and its western allies, and on the other the Soviet Union, China and



TAM ARCHIVE

OPPOSITE PAGE Spitfire XIX PS852, in which Flt Lt Ted Powles made a series of overflights of Chinese territory in 1951, at its base at Kai Tak, Hong Kong, in 1953. **TOP** North American RB-45C 48-037 of the 91st SRW's Detachment A, which conducted vital early overflights of North Korea, China and the Soviet Union. Note the "all-seeing eye" nose.



LEFT American President Harry S. Truman (seated left) discusses the Korean crisis with British Prime Minister Clement Attlee in the Oval Office during Attlee's visit to the USA in early December 1950. Secretary of State Dean Acheson (standing left) and Secretary of Defense George C. Marshall look on. It was at this series of discussions that top-secret overflights of Korea, China and the Soviet Union were sanctioned.

BELOW Lockheed RF-80A 45-8417 of the 8th Tactical Reconnaissance Squadron at Taegu in South Korea during 1950-51. The standard F-80's radio compass antenna was removed on the RF-80 to make space for a K-18 camera with a 36in lens, which took forward oblique photos through a transparency in the nose.

their partners. It was the capitalist West facing off with the communist East, with the two blocs sharing their mutual distrust, despite the major players having been allies in the fight against Nazi Germany.

This mutual animosity intensified throughout the latter part of the 1940s, and was exacerbated by the detonation of the Soviets' first atomic bomb in 1949. It finally led to armed conflict when, on June 25, 1950, the North Korean People's Army rolled across the 38th Parallel into South Korea, encouraged by both the Soviet Union and China. The United Nations (UN) responded by sending forces to repel the North Koreans, initially with some degree of success. However, in early November China openly fielded troops in support of the North Koreans and pushed back the UN forces.

The response of the American President, Harry S. Truman, to this escalation of the conflict was to declare on November 30, 1950, that the UN Forces in Korea were determined to fight to the bitter end:

"The President wants to make it certain that there is no misinterpretation of his answers to questions at his press conference today about

the use of the atom bomb. Naturally, there has been consideration of this subject since the outbreak of the hostilities in Korea, just as there is consideration of the use of all military weapons whenever our forces are in combat."^{1*}

The world stood on the brink of World War Three. The threat of all-out nuclear conflict suddenly became very real, and with it the realisation that every nation was open to a surprise attack. It was one thing to protect your own bombers on the ground and in the air; but how could you insure against the threat of an unheralded atomic attack on your own territory? It was this preoccupation which prompted the USA and its allies to commit to an overflight programme.

On December 4, 1950, British Prime Minister Clement Attlee flew to Washington DC for discussions with Truman. Among other things, the two sides agreed to conduct overflights of the Soviet Union, China and their allies in order to determine the number and disposition of the bomber forces that could be used against the Western allies in the event of the conflict in Korea spreading. So began a policy of authorising overflights by manned military aircraft; a policy which would last for decades and cease only with

* ENDNOTE REFERENCES ARE PROVIDED AT THE END OF THE ARTICLE

ED STOLTZ VIA AUTHOR



A very heavily-laden RF-80 uses rocket-assisted take-off (RATO) equipment to get off at Yokota. The large underslung "Misawa" extra-long-range tiptanks were made at Yokota using standard F-80 165 US gal tiptanks with two additional sections inserted in the middle, each reportedly capable of holding some 265 US gal.

COL RAY W. SCHREENGOST JR VIA USAF



the deployment of satellite surveillance systems. The truth, however, was that both British and American overflights had been authorised above Soviet territory before the outbreak of the conflict.

SNEAKING IN THE BACK DOOR

In the Far East USAF flights were conducted by two pilots of the 8th Tactical Reconnaissance Squadron (TRS), based at Yokota Air Base, 25 miles (40km) west of Tokyo. The unit had recently received the Lockheed RF-80 reconnaissance variant of the Shooting Star, and the flights were to be a response to increased Soviet belligerence, exemplified by the latter's blockade of Berlin and the accompanying sabre-rattling.

One of the pilots tasked with these missions was 1st Lt Bryce Poe (seen at **RIGHT** at Taegu in late 1950). The first flights were not over the Soviet mainland but over Sakhalin, the large Soviet-held island in the Sea of Okhotsk between Japan and Russia, and the Kurile chain of islands north of Japan. On May 10, 1949, Poe flew his first mission over the Kuriles. The RF-80s were equipped with special long-range tiptanks on their wings for these missions. The pilots would detach from Yokota to Misawa where they would refuel.

When the coast was considered clear they would take off, make a dash for their targets and then hightail it for home. The designated targets were mainly airfields and the flights were often intercepted by Soviet Lavochkin La-9 and La-11 piston-engined fighters, which sometimes got too close for comfort for the pilots of the RF-80s, the manoeuvrability of which were substantially compromised by the heavy and unwieldy tiptanks they carried. Thankfully there were no instances of successful interceptions by the Soviets. Poe conducted his first flight over the Soviet mainland on March 10, 1950, when he photographed the port of Vladivostok.



COL RAY W. SCHREENGOST JR VIA USAF

In the Middle East in 1948 RAF de Havilland Mosquito PR.34s of No 13 Sqn had undertaken special flights from Habbaniya in Iraq. These had involved overflying the Caspian Sea area and the southern states of Russia. In Europe Mosquito PR.34s of No 58 Sqn had overflown eastern Germany as part of Operation *Dimple* in 1949.

In late 1950 Yokota became home to Detachment A of the USAF's 91st Strategic Reconnaissance Wing (SRW), which flew a variety of aircraft, including the North American RB-45C Tornado, the reconnaissance variant of the USAF's latest jet bomber. Despite the fact that the Russians were determined to get their hands on a Tornado and harassed the aircraft at every opportunity, the RB-45C was nevertheless used for overflights during the Korean conflict. Many of these were over the North Korean mainland, and it was on one of these missions that RB-45C 48-015 was shot down by MiG fighters on December 4, 1950.

This, however, did not curtail the operations of

North American RB-45C 48-014 of the 91st SRW at Yokota, in a standard bare-metal scheme with dark anti-glare panels on the upper nose, engine nacelles and inner tiptank surfaces. The aircraft also sports the "bloodshot eye" on the nose, an artwork of a shapely woman "au naturel" on the forward fuselage and shark's-teeth markings on the nose and tiptanks.



the RB-45s. On the evening of June 5, 1951, Capt Stacey Naftel took off from Yokota for a flight to his target area in central China. The flight was long enough to require the RB-45 to refuel en route. The mission, however, was aborted 30min after the Tornado had entered Chinese airspace — MiGs were waiting for the spyplane and there was no choice but to turn back in the face of a sky filled with contrails.

Naftel's second mission from Yokota took place on July 4, 1951. His copilot was 1st Lt Ed Kendrix and the navigator was Capt Bob Dusenberry. Naftel recalled in 2001:

"It too was a moonless night mission intended to gather radarscope photography of a military complex in the Harbin area of Manchuria. We flew across the Yellow Sea, entering Chinese airspace in the area of Port Arthur and Dalian. Our flightplan called for us to follow the railroad line north-east to Fushun, then to Changchun, with our target in the Harbin area. Our flight was over 500 miles [800km] of desolate, hostile territory.

"About halfway up the line of flight, while cruising at an altitude of 34,000–35,000ft [10,400–10,700m] near the city of Fushun, the copilot and I noticed what appeared to be roman candles exploding off our starboard wing. I banked the aircraft sharply to check the ground, thinking

this must be hellishly high anti-aircraft fire. There was nothing but blackness below us, so as the roman candles kept popping up off our right wing, I asked Kendrix to turn his seat around and see if there was anything back there. What seemed like a fraction of a second later I heard Ed exclaim: 'My God Stace, there are about seven aircraft back there in echelon! They've all got their navigation lights on'. Of course we were blacked out. They were in echelon to the right and appeared to be firing in turn until each expended their ammunition and dropped off to the left, to be replaced by the next in line. This went on for some time, while we went through a series of corkscrew manoeuvres, varying heading and altitude, trying to shake them off and spoil any lock-on stability they may have had at that altitude. This attack and our evasive manoeuvres lasted 29 minutes.

"After the MiGs broke off Dusenberry gave me a revised heading into the area of Harbin. The radarscope photography that we obtained was to be used by bomber forces that might be ordered to strike these targets at a later date."²

Naftel's crew made it safely back to Yokota, but with less than 300 US gal of fuel left. The mission had taken 5hr 50min to complete.

These overflights of the Chinese mainland were

An RB-45C Tornado of the 91st SRW shares ramp space on the flight line at Yokota with the unit's Boeing RB-29s. The tiptank and wing at the far left of the photograph may belong to RB-45C 48-027, which was painted all-black with red tail markings in an attempt to counter searchlight locks on aircraft operating at low to medium altitudes.

WARREN THOMPSON COLLECTION



With a toothless mouth painted on the nose and stylised red arrows on the outer tiptank surfaces, RB-45C 48-027 is seen here before it was painted all-black with a mixture of zinc chromate and black lacquer. The weight of the paint made a small difference on top speed, but the idea was found to be effective in countering searchlight lock-ons.



monitored by specially-equipped Electronic Intelligence (ELINT) aircraft which remained outside restricted airspace but loitered off the coast. While the RB-45 was over Chinese territory an ELINT Boeing RB-29 or RB-50 would monitor and record all transmissions emanating from hostile aircraft and ground controllers. These ELINT aircraft would often have special security personnel aboard able to speak Chinese. Most flights in the RB-45s were nocturnal but in August 1951 Naftel and his crew flew over the naval base at Vladivostok on a daylight photo-recce mission. They encountered no unfriendly fire.

Captain H.S. "Sam" Myers was assigned to Det A in October 1952 and flew a number of missions over the Chinese and Soviet mainland:

"One mission we flew departed from Chitose on the northernmost Japanese island of Hokkaido. From there we flew over Sakhalin, which was then entirely a possession of the Soviet Union. During this mission I had an escort of three [North American] F-86s on my wing, but about halfway up Sakhalin, when their fuel expended, they peeled off and returned to base.

"We were often provided with escorts. The RB-45C had fixed guns in the tail, one pointing straight back and one canted forward, but it had no gunner and the pilot fired the guns from the cockpit. Fighter escorts therefore provided a higher degree of safety than we could provide with our own armament.

"On this particular mission, however, we were flying at about 25,000ft [7,600m] and were not intercepted by any Soviet fighters while we took a great many photographs of Soviet activities in the area. We used an excellent forward-looking camera slanting downward in the nose of the RB-45 for these reconnaissance missions. We also had more cameras mounted in the back of the aircraft behind the bomb bay."³

In addition to taking high-altitude daytime photographs the RB-45 crews undertook night missions for radarscope photography, in order to

obtain a film record of the returns made on a radar screen. These photographs would aid bombers in finding their targets at night. Sam Myers flew one such mission in RB-45C 48-027, which was painted all-black. He describes the mission:

"On the night of December 17-18, 1952, my crew and I flew 027, the all-black RB-45C, on a deep penetration mission to Harbin to take radarscope photography of an airbase in that area. Captain Yancey was the copilot while 1st Lt Francis Martin was the navigator/radar operator.

"We managed to penetrate Chinese airspace with no problem and Frank took the pictures without incident, but when we began making a 90° turn to begin our departure, I saw MiGs taking off from the runway we had just photographed. We knew that they were out to get us, so we throttled up to go as fast as we could and managed to exit China, fly through North Korea and land safely at K-13 [Suwon Air Base] in South Korea."⁴

THE BRITISH EFFORT

In the meantime the RAF was also becoming involved in a number of overflights. On January 16, 1951, the RAF undertook its first overflight sortie since the meeting between Truman and Attlee the previous month. Flying Supermarine Spitfire PR.XIX PS852, Flt Lt Ted Powles overflew a number of Chinese islands in the vicinity of his base at Kai Tak, Hong Kong. Powles was assigned to No 81 Sqn at Seletar, and had detached to Kai Tak with two Spitfires to undertake a series of clandestine sorties in which he was to photograph various installations. Some of the images were taken with an oblique camera looking into China from the coast.

Powles also flew two missions overflying the island of Hainan, which was at the limit of the Spitfire's range from Kai Tak. The flights required a good deal of preparation and the assistance of a US Navy destroyer and a Short Sunderland flying-boat to provide accurate weather reports and rescue services, should they be needed.



ABOVE Supermarine Spitfire PR.XIX PS836 during its tenure with No 81 Sqn, a crucial part of the Far East Air Force's reconnaissance element. It was a squadron-mate of this aircraft, PS852, in which Ted Powles overflew Chinese territory from Kai Tak in January 1951; PS836 survives today and is undergoing restoration in Thailand.

On the first of these missions, on May 22, 1951, Powles made three target runs over the dock area and airfield on Hainan. He had originally planned only two target runs and as he left the area his fuel was at critical. After making a diversion into cloud to avoid interception by two unidentified aircraft, he eventually made it back to Kai Tak, making a deadstick landing.

The second mission took place on August 27, 1951, Powles photographing the port and airfield at Haikou on the north-eastern coast of Hainan. Again he was obliged to make a deadstick landing at Kai Tak. His final Spitfire overflight took place on November 6, 1951, and was another long-range flight, this time over the Paracel Islands in the South China Sea. For his overflights Powles was awarded the Air Force Cross. As an aside, he also gained the distinction of being the highest-flying Spitfire pilot when he took his PR.XIX up to 51,550ft (15,712m) while conducting a routine weather flight on February 5, 1952.

In July 1951 Sqn Ldr John Crampton, CO of Avro Lincoln-equipped No 97 Sqn at RAF Hemswell, received a summons from the chief of Bomber Command, to be told that he was to command the top-secret Special Duty Flight, which would be receiving four RB-45C Tornados. The flightcrew for each of the aircraft assigned would comprise two pilots and a navigator. On August 3, 1951, Crampton and the other crew members flew from RAF Sculthorpe, home of the Tornado-equipped 47th Bombardment Wing, to Barksdale AFB, Louisiana. Initial training on the B-45 at Barksdale was followed by courses on the RB-45C at Langley AFB, Virginia, and Lockbourne

AFB in Ohio, the latter being the home of the 91st SRW, which had detachments at Yokota and Sculthorpe. Type conversion was completed at the end of November and on December 1, 1951, the crews returned to RAF Sculthorpe.

In February 1952 the British Prime Minister, Winston Churchill, authorised an overflight of the Soviet Union, at which point Crampton and his crews were apprised of the nature of their secret mission, to be codenamed *Jiu-Jitsu* (also referred to in official files without the first "i", i.e. *Ju-Jitsu*). Crampton later recalled:

"This was the moment of truth and I confess to some apprehension when the charts were unrolled to show three separate tracks departing Sculthorpe in rapid succession to rendezvous with the tankers to the north of Denmark. After a maximum top-up we were to climb at maximum continuous power to Mach 0.68 to the highest altitude the night-time temperature would allow. Our targets were Soviet airbases, missile sites and similar areas of strategic importance. We were to take 35mm photos of the aircraft's radar display when the targets were located and identified."⁵

The British justification for *Jiu-Jitsu* was to gather intelligence which would enable the USAF, in the event of war being declared, to mount an immediate offensive against the Soviet long-range bomber force's airfields before they could be used to launch an attack against the UK and other nations of the West. It was argued that RAF Fighter Command alone would not be able to defend the UK against an all-out Russian atomic attack, and the best way of mitigating the scale of such an attack would be to destroy as many Soviet



PHILIP JARRETT COLLECTION

ABOVE Bearing only RAF roundels and fin flashes and with no serials, the four RB-45Cs lent to the RAF for Operation Jiu-Jitsu are seen here at RAF Sculthorpe in the spring of 1952, along with their associated crews and ground staff. Three RB-45s were to be used for the sorties, the other being a spare in case of unserviceability.

bombers as possible on their airfields on the outbreak of war. In order to do this successfully it was necessary to obtain accurate and concrete intelligence about the disposition of the Soviet bombers and secure radar photographs of their airfields before any prospective conflict began.

As was common practice, the flights would be closely monitored by ELINT aircraft, which would search for any signs of a Soviet interception or other activity. On his return to Sculthorpe, Crampton briefed his crews and preparations were made. For the purposes of the overflights the USAF RB-45s were painted in RAF roundels, but without any other serials or unit markings. On February 24 Churchill gave his approval for the flights and on the evening of April 17, 1952, the three Tornados took off from Sculthorpe and headed out for their rendezvous with the tankers over Denmark. Crampton continues the story:

"We picked up our tankers, took on every pound of fuel we could and headed south-east over the Baltic Sea into the black night. All was going well; Flt Lt Rex Sanders was getting good plots on his radar and feeding me with the courses to steer to our 126 intelligence targets. We had the long-haul sortie, south-east across Russia.

"My most abiding memory of the route across the Ukraine is the apparent wilderness over which we were flying. There were neither lights on the ground nor any sign of human habitation, quite unlike the rest of Europe. We continued our gentle climb at Mach 0.68 to 36,000ft [11,000m] and covered our briefed route, taking the target photographs as planned. It was all so quiet as to be distinctly eerie.

"Finally we turned for home and in due course began to let down into Sculthorpe. We landed without incident after 10hr 20min in the air. Further to the north the other two aircraft had covered all their targets, making the operation a complete success."⁶

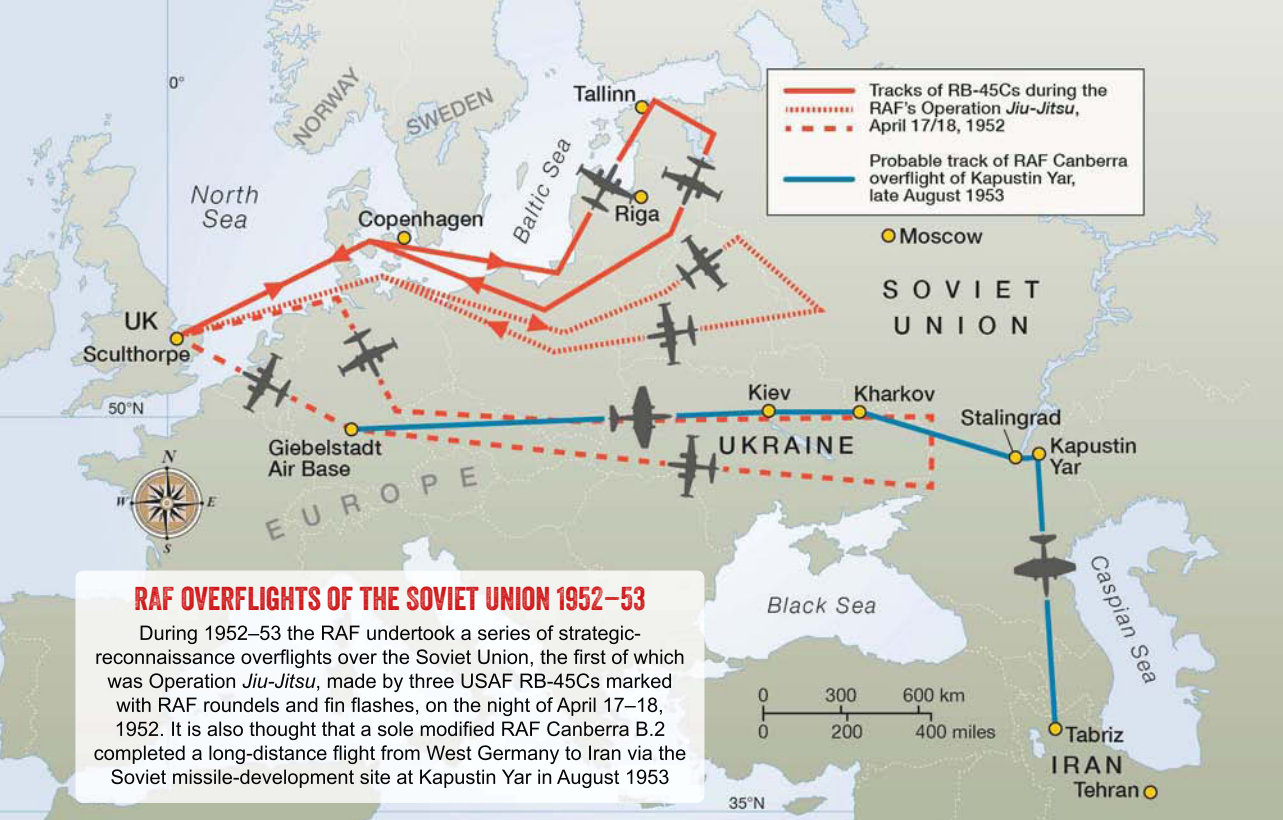
THE NEED FOR ANOTHER GO

A February 1954 Air Ministry document, marked "Top Secret", details the results of the April 1952 Jiu-Jitsu missions: "Valuable results were obtained. Photographic cover was secured on 20 of the known or suspected 35 Soviet Long-Range Air Force airfields. Of the 20 airfields photographed, the material on nine was indifferent. There is still no cover on 15 airfields."

Much-needed intelligence was also gleaned from the nature of the Soviet air-defence reactions to the overflights, or rather the lack of any reaction at all. The report continues:

"An important by-product of these operations is the knowledge obtained of the Soviet air defence system . . . the operation showed that the Soviet air-warning organisation is liable to error and delay; fighter reaction was slow [and] there was no evidence of an AI [airborne interception radar]-equipped nightfighter. The net result is that while the defences have improved, it seems unlikely that at the heights the RB-45s operate (40,000ft), the improvement will be sufficient to increase very materially the chance of interception. This appears to be slight."⁷

Having concluded these successful overflights, the RAF personnel returned to their units. Much to his delight, John Crampton was posted to



MAP BY MAGGIE NELSON

Binbrook to command No 101 Sqn, recently reformed with the English Electric Canberra. In October 1952, however, he received a call to re-join the Special Duty Flight.

It was intended that a second overflight could build on the successes of the first and obtain the required intelligence on the Soviet airfields not yet covered by radar photography. It was acknowledged that, because Soviet air defences were improving all the time, it was imperative to obtain the information while it was still possible to do so. However, after a period of preparation at Sculthorpe, the project was cancelled and the crews once again returned to their units.

The reasons for the cancellation were outlined in a letter from the British Foreign Secretary, Anthony Eden, to the Secretary of State for Air, William Sydney Lord De L'Isle and Dudley, on November 28, 1952. Eden opined that, because more time would be spent over Soviet territory, the operation would be more dangerous than the first. He argued that the operation, by its nature, would be more beneficial to the USA than to the UK, because it would be gathering information to aid the USAF's Strategic Air Command bombers on their atomic offensive missions against Soviet airfields. He added:

"I do not understand why it is thought right that, in the interests of collecting intelligence for this offensive, we should accept risks which the Americans will not accept."⁸

Eden also stated his concern that such operations may prompt a pre-emptive nuclear strike

against the Western powers by a nervous Soviet Union. Bearing in mind that the reasons Eden gave for not supporting the second flight could have been applied just as strongly to the first, it is difficult to ascertain the real reason for the cancellation. Despite Eden's scepticism, the Special Duty Flight would nevertheless be called to active duty again in 1954 for what was referred to in official correspondence as Operation *Jiu-Jitsu II* — see opposite page.

THE MYSTERIOUS KAPUSTIN YAR OVERFLIGHT

The RAF was almost certainly also involved in yet another overflight, the details of which, to this day, have never been officially released. The flight has never been acknowledged by the British or American governments. The object of this alleged mission was to photograph the Soviet missile development base at Kapustin Yar (now Znamensk), a remote site near the Volga River, north of the Caspian Sea and east of Stalingrad (now Volgograd).

Churchill reportedly authorised this overflight and preparations were made. It is believed that an English Electric Canberra B.2 was modified to take a large port-facing oblique camera and extra fuel tanks in its bomb bay. All excess weight was removed. It would not be possible to refuel this aircraft in flight so it needed to carry sufficient fuel for the return journey.

It is thought that the Canberra probably took off from Giebelstadt Air Base in Bavaria in late August 1953. It was tracked by radar as soon as

OPERATION JIU-JITSU II AND BEYOND . . .



IN MARCH 1954 Sqn Ldr John Crampton was called on again to command the RAF Special Duty Flight at Sculthorpe for another deep penetration sortie into Soviet territory. Once again three RB-45Cs in RAF markings were to overfly specific targets in the Soviet Union, flying three separate tracks similar to those flown on the first *Jiu-Jitsu* mission in April 1952. Their task was to take radarscope photography of specific locations for inclusion in the target folders of the bomber aircraft intended to bomb the Warsaw Pact nations in the event of a nuclear war.

The three aircraft took off from Sculthorpe during the late afternoon of April 28, 1954, and headed for their refuelling rendezvous point over northern Denmark. With refuelling successfully concluded, the RB-45s went their separate ways. The most northerly route was flown by Flt Lt Harry Currell and crew, the central route by Flt Lt Gordon Cremer and his crew, and the southerly route by Crampton, with copilot Flt Lt Robert McAlastair "Mac" Furze and navigator Rex Sanders, a veteran of the first *Jiu-Jitsu* sortie.

Crampton's flight took him out over West Germany and into Czechoslovakia. From there he passed over Krakow in Poland and headed out over the Soviet Union towards Kiev, Kharkov and Stalingrad. This was to be the longest route flown and the most hazardous. Before take-off the crews had been briefed on particular dangers they may have to face; there was a possibility of interception by fighters, albeit remote, as there were no radar-equipped nightfighters. There was, the briefing stated, absolutely no likelihood of anti-aircraft fire reaching them at the height they were flying. The reality, however, was to prove somewhat different, as John Crampton later recalled:

"Occasionally I saw flashes from the ground similar to lightning or to an active bombing range at night, reflected on the cloud cover. It was causing no harm but it was puzzling. Having taken [some] photos, we headed towards Kiev at 36,000ft [11,000m] at Mach 0.7, when the electrical storm or bombing flashes seemed to get more frequent, always directly beneath us — altogether odd for a random phenomenon.

"My reverie was rudely interrupted by the sudden heartstopping appearance of a veritable flarepath of exploding golden anti-aircraft fire dead ahead. No doubt remained that it was very-well-predicted flak, now detonating at our height. My reaction was instinctive. The throttles were opened wide and I hauled the aeroplane round on its starboard wingtip until the gyro compass pointed west. I began a gentle 100ft/min [30m/min] descent that made us seem to go a bit faster — although it didn't because we were juddering in the limiting Mach-number buffet. So I eased the power off a bit, but kept up the descent on the 'it seems faster' principle, and since we had been observed I thought it best to change height as well as



ABOVE Squadron Leader John Crampton (with brief-case) beside an RB-45C at Lockbourne Air Force Base in Ohio during the *Jiu-Jitsu* crew's training period on the *Tornado* in the USA. Crampton, who was 31 when called on to undertake the first *Jiu-Jitsu* flight, retired from the RAF in 1957, and in 1959 joined Hawker, later becoming Technical Sales Manager (Harrier).

speed and direction, thus giving the gunners below three new problems."

Crampton made directly for the USAF base at Fürstenfeldbruck in West Germany, where he landed and refuelled — an attempt at aerial refuelling had been unsuccessful — before returning to Sculthorpe. Crampton later learnt that fighters had been scrambled to intercept the RB-45s with orders to ram. The anti-aircraft fire, had it been more accurate, would undoubtedly have brought the spyplane down. It was fortunate that the early barrage had misjudged the height of the aircraft, and that over Kiev the AAA crews had misjudged its speed. Had the battery commanders been more competent the international repercussions of the second overflight could have been profound.

Despite these problems the RAF Special Duty Flight's sortie of 1954 was not to be the last of the *Tornadoes'* overflights. Their swansong came on the evening of March 29, 1955, when Maj John Anderson flew out of Sculthorpe in the lead aircraft of three RB-45Cs of the 19th Tactical Reconnaissance Squadron (TRS), which had arrived in the UK in May 1954, bringing with it *Tornadoes* transferred to Tactical Air Command from Strategic Air Command. Major Anderson was the squadron commander.

The 19th TRS overflights were to follow much the same initial tracks as those flown by the RAF the previous year, but did not penetrate Soviet Union airspace. Anderson and his crew flew over Hungary on the deepest mission into enemy territory, Capt Robert S. Chambers and crew surveyed East Berlin and Capt Bert Grigsby and his crew overflew Yugoslavia. None of the flights ran into problems, although there is little doubt that Soviet aircraft were scrambled after them but failed to find them in the darkness. **DG**



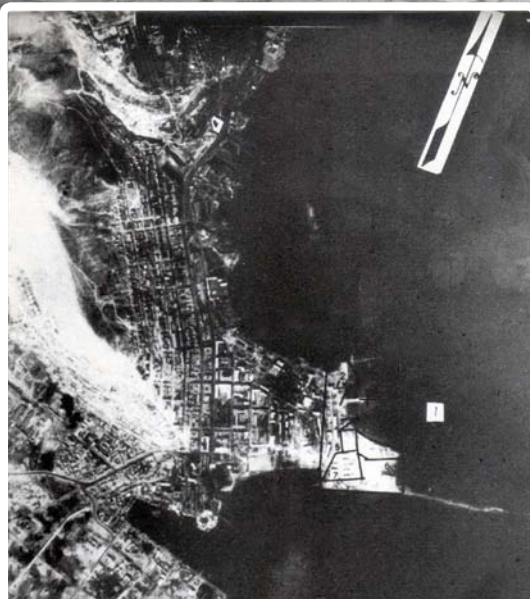
TAH ARCHIVE

ABOVE *The English Electric Canberra was the world's most advanced aerial reconnaissance aircraft in the early years of the Cold War, being fast and capable of very-high-altitude flight. This example is PR.3 WE146, photographed in 1953. RIGHT* A high-altitude photo of the port of Baku on the western shore of the Caspian Sea taken by an RAF Canberra in the early 1950s.

it entered Soviet airspace and there were frantic attempts to intercept it, but the MiG-15s scrambled could not reach the Canberra at 46,000–48,000ft (14,000–14,600m). Following a route over Kiev, Kharkov and Stalingrad, the Canberra eventually reached Kapustin Yar. It was here that the fighters reportedly managed to make contact, scoring a number of hits on the RAF aircraft. However, it flew on and completed its photo-run before turning south-east to follow the Volga out of the Soviet Union and land in Iran, possibly at Tabriz, the airfield closest to the Russian border.

It is believed that, unfortunately, the hits on the aircraft had caused vibrations which blurred the photographs. They were of little use. What the flight may have done, however, was initiate a purge of Soviet air-defence personnel. It is still a mystery who flew the aircraft on the sortie; indeed, according to official records it never happened at all. There is a suggestion, based on recent submissions to the oral history programme of the USA's Central Intelligence Agency (CIA), that there were in fact two CIA officers aboard the Canberra, and that no RAF personnel took part. Other sources, however, suggest that the Canberra was crewed by No 540 Sqn personnel.

What is evident is that numerous PARPRO flights did take place along the borders of the Soviet Union and the Warsaw Pact nations



BARRY WHEELER COLLECTION

using a special camera designed by James G. Baker, a Harvard astronomer, and fitted in an RAF Canberra B.2. This oblique camera featured folded optics which ensured that the 240in-focal-length f20 lens fitted into a cylinder 10ft (3m) long and 41in (104cm) in diameter.

CORALLING THE BULL

A significant concern for the Americans in the late 1940s and early 1950s was the proliferation of the Soviet Union's Tupolev Tu-4 bomber (given the Nato reporting name *Bull*). In 1944 the Russians had acquired several Boeing B-29 bombers when US Army Air Forces examples had made forced landings in the Soviet Far East, the Soviets ingeniously reverse-engineering these to produce more than 800 Tu-4s.



What was alarming for the USA was that these bombers, if based in the eastern Soviet Union, possessed the range to attack the American mainland. Many of the overflights performed in the early and mid-1950s were made specifically to monitor the Soviet build up of Tu-4s in Siberia and the Soviet Union's eastern provinces.

In 1951 a US Navy/USAF joint operation was planned, in which Navy Patrol Squadron VP-931, based at Kodiak, Alaska, would refit one of its Lockheed P2V-3W Neptunes with special sensor equipment capable of intercepting and locating new search radars the Soviets had installed in Siberia. In March 1952, after exhaustive testing of the equipment, the operation was given the go-ahead. The Neptune would work in co-operation with a USAF photo-reconnaissance RB-50E. On April 2, 1952, the two aircraft, along with a rescue-boat-equipped Boeing B-17, took off in radio silence for the mission. Lieutenant Richard Koch was the copilot of the Neptune, and recalled:

"The three aircraft retained visual contact until the B-17 departed for its offshore track over international waters, to where the RB-50 and P2V were to proceed in case of an emergency. The RB-50 flew at 15,500ft [4,720m], with the Neptune slightly lower at 15,000ft [4,570m].

"Flying northward over the Soviet coastline, we proceeded to intercept and track radar signals in Siberia in the vicinity of Rukavichka on the lower Kamchatka Peninsula. Using direction-finding, the Neptune would vector on and overfly radar installations and airfields, taking photos of its radarscope while the RB-50 took photos on film.

"The intelligence-gathering effort was time-triggered. The RB-50 took overlapping time-coded

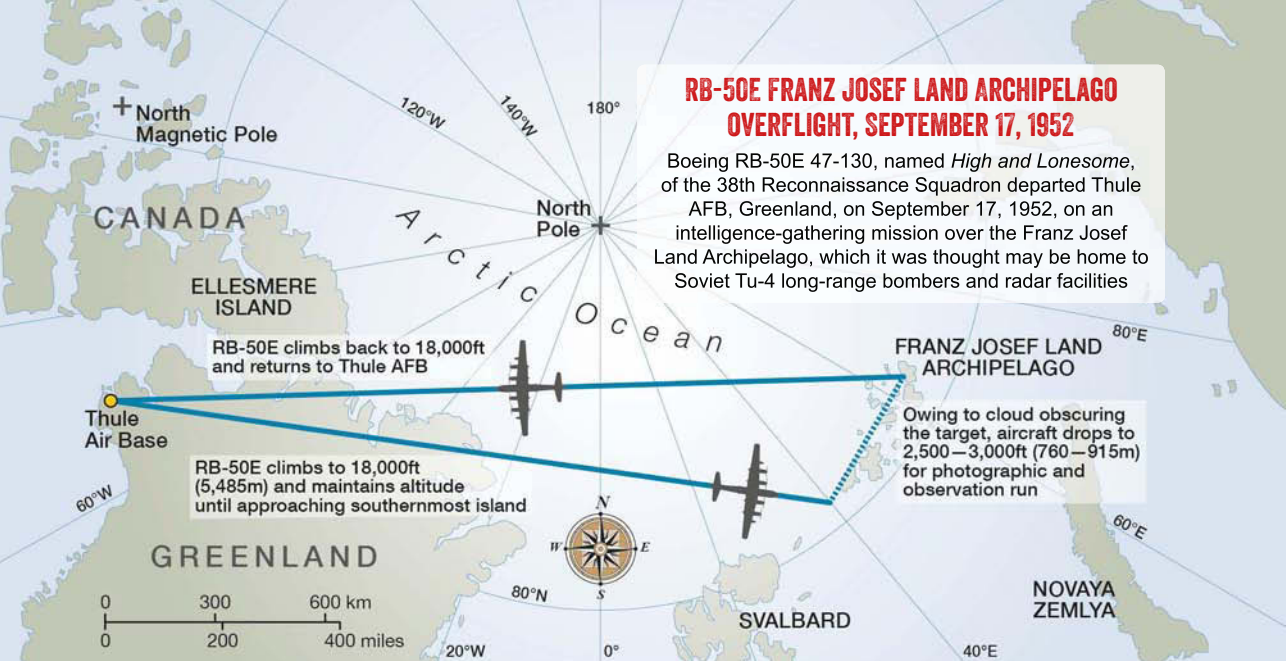
ABOVE When plans were put in place to undertake a series of flights over the Siberian coast with the Boeing RB-50s of the 55th SRW in conjunction with the Lockheed Neptunes of US Navy unit VP-931 — "The Flying Eagles" — the latter type was no stranger to the region. The P2V-2s of VP-32 had surveyed the icy wastes of Alaska back in 1948, as seen here.

photographs and the electronic countermeasures [ECM] intercepts of Soviet radars were also time-coded, so that the lines of intercept could be overlaid on the geographic photographs to locate the exact position of the radar site. With two or more lines of intercept, the positions of the radar sites could be geolocated with great accuracy."⁹

Between April and June 1952 some nine or ten missions were flown, not all being completed as smoothly as the first. On one occasion the Neptune was returning home to Kodiak when it was intercepted by USAF Lockheed F-94s as an intruder. Forced to land at Fairbanks, Alaska, the crewmembers were confined to the aircraft by armed military policemen until someone could be contacted to vouch for them. On two occasions both the Neptune and the RB-50 were intercepted by MiG-15s; once over the Bering Sea and once over Soviet territory. Surprisingly, they were not fired upon on either occasion. The last of these missions was flown on June 29, 1952.

HIGH AND LONESOME . . .

During the autumn of 1952 the northern Soviet Union was once again the focus of the USAF's attention. In September that year an RB-50E of the 38th Reconnaissance Squadron (RS) took off from Thule Air Base in Greenland to overfly the islands of Franz Josef Land in the Arctic Ocean, Barents



Sea and Kara Sea. Once again the mission was in search of Tu-4 *Bull* bombers. Intelligence had been received that the aircraft were being based at airfields on the north-western coast of Siberia.

The purpose of the RB-50 mission was twofold: to look for any new airfields on the archipelago capable of supporting Tu-4 operations, and to search for, intercept and record any radar emissions coming from the group of islands. Having spent some time in the UK flying PARPRO missions over eastern Europe, the 38th RS received orders in August 1952 to detach one aircraft and crew to Thule to fly a top-secret photographic and electronic mission.

Nicknamed *High and Lonesome*, RB-50E serial 47-130 was duly assigned, and arrived at Thule on September 4, 1952. With Maj Roy E. Kaden at the controls, *High and Lonesome* took off during the early morning of September 17. Some of the required photography was not possible because the aircraft had to fly at a lower altitude to get below the cloudbase. The crew supplemented the information they could provide from the photos

with visual observations. The conclusion was that there was no Soviet presence on the islands. After 14hr in the air the RB-50 landed back at Thule.

With the end of the conflict in Korea in mid-1953 the USA, under President Dwight D. Eisenhower, who had been elected in January of that year, committed itself to a programme of peacetime overflights of the Soviet Union and its allies. This would come to be known as the Sensitive Intelligence programme. For a period of two to three years these flights would be performed as they had before — by using military aircraft in service use, specially modified for the purpose. But that's another story . . .



ENDNOTE REFERENCES

1 Stacey Nafel, *Early Cold War Overflights 1950–56* Symposium, Tighe Auditorium, Washington DC, February 22–23, 2001 2 ibid 3 Sam Myers, ibid 4 ibid 5 John Crampton, ibid 6 ibid 7 Air Ministry, Ministry of Defence, Air Department and Private Office papers; The National Archives AIR19/1126 8 ibid 9 Cdr Richard Koch, *Early Cold War Overflights 1950–56* Symposium, op cit

The 55th SRW's RB-50 The Cock 'n' Bull comes in to land after another long mission. During April–June 1952 the Wing's RB-50s completed a series of overflights of the Siberian coast with P2V-3Ws of VP-931. The type was also used by the Wing's 38th RS for the Franz Josef Land mission from Greenland in September 1952.



WARPAINT BOOKS

WHAT'S IN A WARPAINT BOOK?

COMPLETE AND DETAILED HISTORY			AIRCRAFT COMPLETE PRODUCTION LISTS		
AIRCRAFT IN DETAIL PICTURES			INDIVIDUAL AIRCRAFT, UNITS, SQUADRONS SERIALS AND CODES		
AIRCRAFT COLOUR AND CAMOUFLAGE DRAWINGS			AIRCRAFT COMPREHENSIVE SPECIFICATIONS		
1 Beaufighter	19 DH Hornet	37 Gloster Gladiator	55 Tempest	73 B-25 Mitchell	91 MiG 21
2 Buccaneer	20 Seafire (Griffon)	38 Thunderchief	56 Firebrand	74 Harrier P 1127	92 Grumman HU - 16
3 Ju 87 Stuka	21 A W Whitley	39 Walrus	57 Hampden	75 Sea Harrier	93 ME 262
4 F-100 Super Sabre	22 Gloster Meteor	40 Canadair Sabre	58 Supermarine Swift	76 Tracker/Trader/Tracer	94 Supermarine Attacker
5 Hawker Typhoon	23 Fairey Gannet	41 Fulmar	59 Lockheed Hudson	77 Curtiss P-40	95 Sea King
6 Avro Shackleton	24 Dornier Do 217	42 Defiant	60 Eng/Elec Canberra	78 Folgore - Veltro	96 B-24 Liberator
7 Junkers Ju88	25 Short Sunderland	43 F-104 Starfighter	61 S.79 Sparviero	79 Catalina	97 Vigilante
8 Hawker Hunter	26 Bristol Blenheim	44 Venom	62 Hastings	80 Saab Draken	98 York
9 F4F Wildcat/Martlet	27 DH Vampire	45 B-57 Canberra	63 Valiant	81 Junkers Ju52	99 F3H Demon
10 Vickers Wellington	28 Fairey Firefly	46 Halifax	64 Convair F-102	82 Jet Provost	100 F-84F
11 DH Sea Vixen	29 Hawker Sea Hawk	47 F-101 Voodoo	65 Wessex	83 Fairley Battle	101 Tiger Moth
12 Fairey Swordfish	30 Avro Vulcan	48 Lysander	66 Bulldog	84 F6F Hellcat	102 Convair B36
13 Fw200 Condor	31 RAF/RH Phantoms	49 Fiat G.91	67 Gnat	85 Scimitar	103 Manchester
14 BAC Lightning	32 Boston/Havoc	50 Beaufort	68 Brigand	86 Wellesley	104 F 111
15 Short Stirling	33 Heinkel He177	51 Lockheed Neptune	69 Marauder	87 TBF Avenger	105 Sopwith Pup
16 Hawker Sea Fury	34 Avro Lincoln	52 Albacore	70 F4U Corsair	88 Lockheed T-33	106 Chicasaw & Westland
17 Gloster Javelin	35 Fairey Barracuda	53 Anson	71 Argosy	89 Lancaster	107 Whirlwind
18 Douglas Skyraider	36 Handley Page Victor	54 Whirlwind	72 Seafire Merlin	90 Boeing B - 17	107 IL2

Much loved series getting bigger...

Warpaint Books, Unit 3, Enigma Building, Bilton Road, Denbigh East, Bletchley, Bucks MK1 1HW Telephone: +44 (0)1908 270400, Fax: +44 (0)1908 270614, Email: kim@regallitho.co.uk

For prices, details of availability and secure ordering

www.warpaint-books.com

All major credit cards accepted. Orders can be placed by mail, telephone, fax or through the website (www.warpaint-books.com) Plus postage on UK orders. Overseas readers pay postage at air mail printed paper rate.



THE NATIONAL AEROSPACE LIBRARY FARNBOROUGH

Aviation and Aerospace
past, present and future

Over 30,000 books, periodicals, pamphlets and documents
chronicling man's dream to conquer flight



Find out more at: W www.aerosociety.com/nal T +44 (0)1252 701038, E hublibrary@aerosociety.com or visit us at Farnborough Business Park based at the historic former RAE site in Farnborough, Hampshire

Owned and operated by

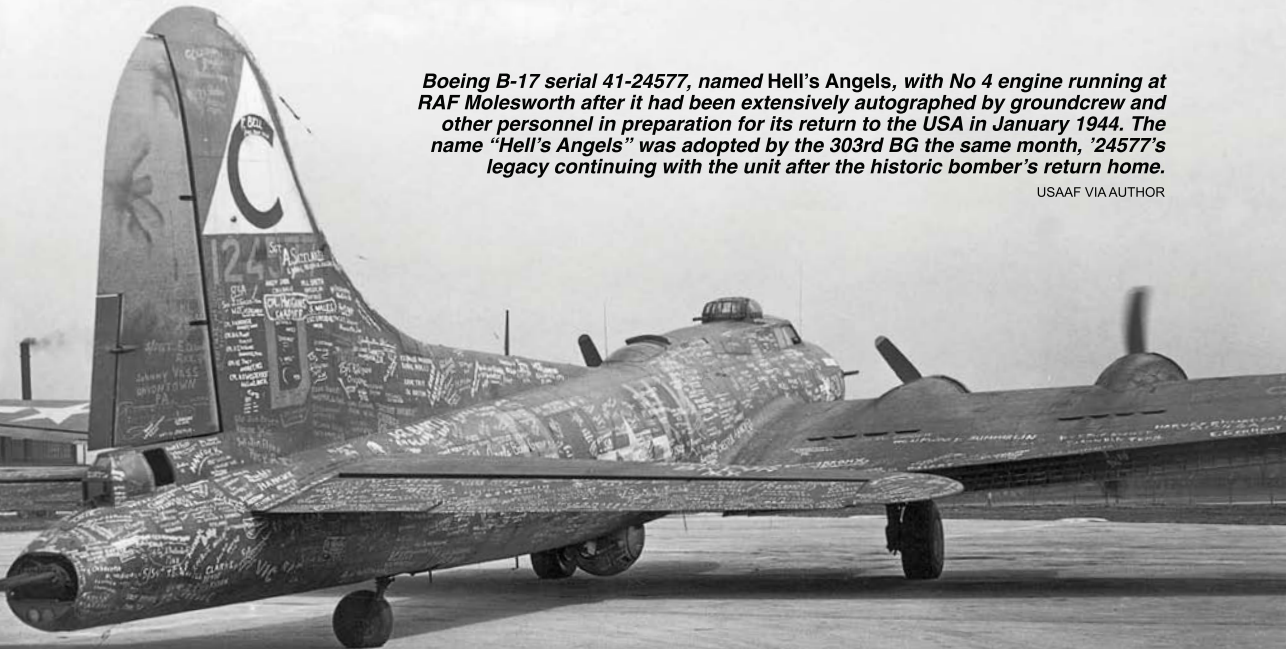


ROYAL
AERONAUTICAL
SOCIETY

2016 • CELEBRATING 150 YEARS

Boeing B-17 serial 41-24577, named *Hell's Angels*, with No 4 engine running at RAF Molesworth after it had been extensively autographed by groundcrew and other personnel in preparation for its return to the USA in January 1944. The name "*Hell's Angels*" was adopted by the 303rd BG the same month, '24577's legacy continuing with the unit after the historic bomber's return home.

USAAF VIA AUTHOR



TO HELL AND BACK...

JUANITA FRANZI continues her series of articles on notable airframes and their markings with the story of the first Eighth Air Force B-17 to complete 25 missions — don't believe everything you see in films!

AFTER MORE THAN 15 months in the UK, Boeing B-17F-25-BO serial number 41-24577, named *Hell's Angels*, returned to the USA in January 1944, after which the battle-scarred and heavily-tattooed warrior was paraded throughout the country on a morale-raising tour. The colourful airframe bore numerous signatures and messages scrawled by the personnel of its unit, the US Eighth Air Force's 303rd Bombardment Group (BG). Behind the signatures, however, earlier markings told a story not only of the crews, but also of an evolving air force dealing with rapid expansion, the demands of war and the need to maintain popular support on the home front.

Built by Boeing in Seattle as one of the first batch of F models, '24577 was sent to Bangor, Maine, where, on October 14, 1942, it was assigned to the 358th Bomb Squadron (BS), one of four squadrons operating with the 303rd BG, whose crews had taken some time to reach the required standard to be sent to the UK. After completing their training, the crews received their new aircraft at Battle Creek, Michigan, for the ferry flight to the UK via Gander, Newfoundland, across the Atlantic to Scotland, and down to their new base at RAF Molesworth in Cambridgeshire.

The 303rd and 305th BGs arrived in the UK on October 16, 1942, a month after the 91st

and 306th BGs. It was originally intended that these four would join forces with the two B-17 groups already in the UK, but the latter were in the process of transferring to North Africa for Operation *Torch*. The 303rd flew its first mission on November 17, 1942.

A NEW NAME FOR A NEW AIRFRAME

Applying art to an individual aircraft's nose was accepted, even encouraged, by the 303rd BG, but it took several weeks before Capt Irl E. Baldwin's crew decided to name '24577 in honour of Howard Hughes's famous 1930 film *Hell's Angels*. Groundcrew member Pt Bernard Kastenbaum painted a cherub on roller skates on the fuselage just aft of the trailing edge; not an unusual location — other 303rd aircraft had artwork applied to the fin or fuselage — but one that soon proved to be unfortunately placed.

The 303rd BG's painters were kept busy that November. First came the application of individual code letters, the aircraft's callsign, to the fins of the eight aircraft in each squadron. These code letters had not previously been used on Eighth Air Force bombers but, with the push towards larger combat formations, it was vital that crews could identify each other in the air.

In December 1942 individual squadron codes

Continued on page 72

BOEING B-17F-25-BO 41-24577, HELL'S ANGELS, 358th BS, 303rd BG, RAF MOLESWORTH, CAMBS, 1942-44

NOVEMBER 1942



Callsign letter "D" applied to fin, November 1942

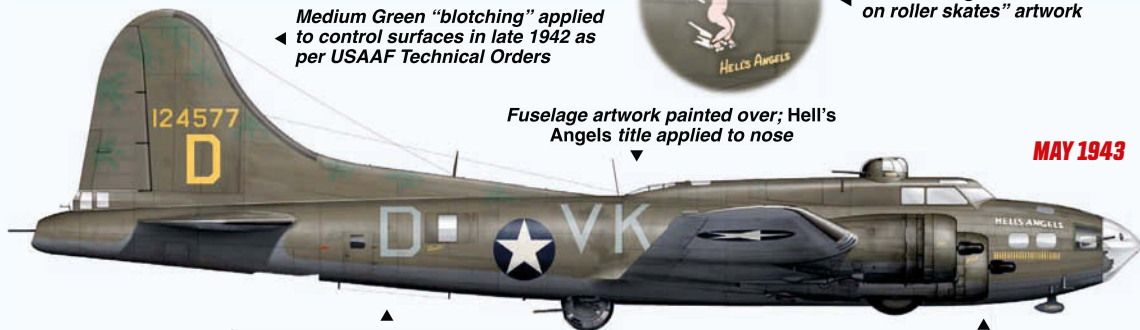
Medium Green "blotching" applied to control surfaces in late 1942 as per USAAF Technical Orders



Detail of original "cherub on roller skates" artwork

Fuselage artwork painted over; Hell's Angels title applied to nose

MAY 1943



Squadron codes "VK" and individual aircraft code "D" applied December 1942

Original mission markings (24 missions)

JUNE 1943

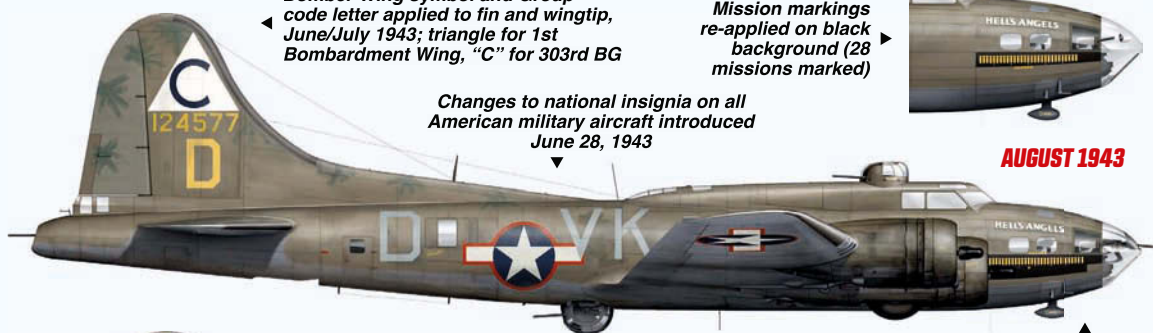
Bomber Wing symbol and Group code letter applied to fin and wingtip, June/July 1943; triangle for 1st Bombardment Wing, "C" for 303rd BG

Mission markings re-applied on black background (28 missions marked)



Changes to national insignia on all American military aircraft introduced June 28, 1943

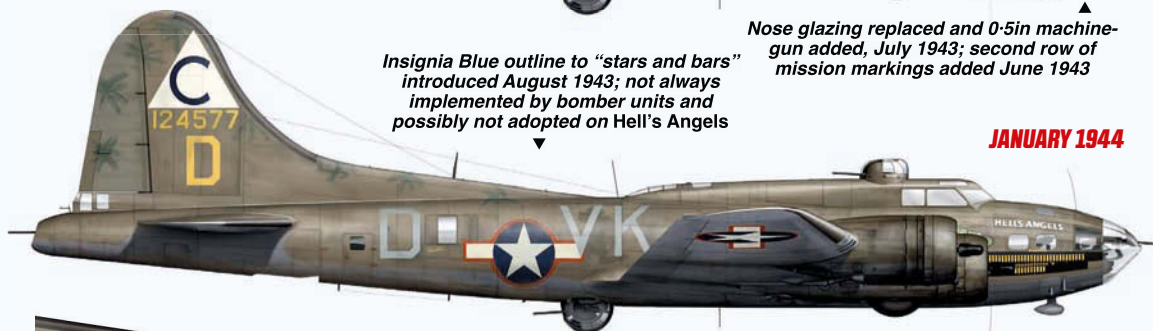
AUGUST 1943



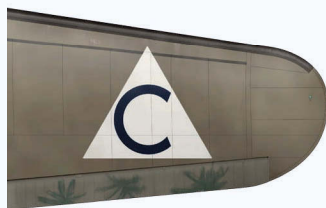
Insignia Blue outline to "stars and bars" introduced August 1943; not always implemented by bomber units and possibly not adopted on Hell's Angels

Nose glazing replaced and 0.5in machine-gun added, July 1943; second row of mission markings added June 1943

JANUARY 1944



Wing symbol and Group code applied to upper surface of starboard wing



Hell's Angels title applied to port side of nose circa October 1943



Cherub artwork painted on nose circa October 1943

Hell's Angels taxis out for departure from Molesworth for its flight back to the USA in January 1944. Once back home it was worked hard on a morale-boosting publicity campaign, which ended on May 19, 1944. After being used as a trainer, it was put into storage the following year at Stillwater, Oklahoma, before somewhat ignominiously succumbing to the scrapman's torch circa 1946.



USAAF VIA AUTHOR

Continued from page 70

were introduced, with "VK" being allocated to the 358th BS. As these letters were to be applied to the fuselage just aft of the trailing edge, the cherub artwork on '24577 was unceremoniously painted over. Only the name, *Hell's Angels*, was reapplied, this time to the nose.

As 1942 rolled into 1943 mission-tally markings began to mount up, with *Hell's Angels* proving to be a reliable aircraft. However, the overall results of the Eighth Air Force's bomber operations were mixed. Weather and crew inexperience caused high losses on several missions, and difficulties arose obtaining replacement aircraft and crews.

Many of the Eighth's senior staff members had been staunch advocates of air power during the pre-war period and were very aware of the value of publicity. Accordingly, a public relations section was established with journalists on staff, some of whom participated in bombing raids. In February 1943 filming commenced on a documentary to be based around B-17F 41-24485 of the 91st BG, named *Memphis Belle*.

Public relations activities intensified as the year progressed. The Flying Fortress was a favourite of the press and, with several B-17s close to completing their first operational tour of 25 missions, a valuable news story was in the making. The first to reach this critical number was *Hell's Angels*, when it completed a raid on the Potez aircraft factory at Meaulte in France on May 13, 1943. However, *Memphis Belle* was promoted as being the first 25-mission veteran, even though it did not actually achieve this milestone until May 17. No doubt this accolade was seen as a useful plot device for the *Memphis Belle* documentary.

Nevertheless, *Hell's Angels* had gained the attention of the media department and by late May the original mission tally markings had been repainted on a black background to ensure the yellow bomb symbols would photograph clearly with monochrome film.

The next major change to '24577's appearance occurred in June–July 1943. Along with the other

squadron aircraft, it was fitted with a forward-firing 0.5in machine-gun in the nose for defence against frontal fighter attack.

In June 1943 the Eighth Air Force introduced a system of symbols and code letters to denote an individual aircraft's Group and Wing. Provisional Combat Wings, each with two Groups, had been established in early 1943 as a means of managing mission logistics. By mid-1943 there were nine B-17 Groups under three Wings. These new bold markings were necessary to assist identification in larger combat formations.

Throughout the second half of 1943, '24577's mission-count steadily rose. It was one of a dwindling number of original 303rd BG aircraft to have survived a year in operations. In tribute to its history the original cherub artwork was reapplied to the nose and duly photographed by the press corps.

Hell's Angels set off for its 49th mission on December 13, 1943, but had to abort when, 30 miles (48km) off the German coast, an engine failed and the propeller could not be feathered. It proved to be '24577's final combat flight. Deemed no longer fit for front-line service, the 48-mission veteran was to be returned to the USA for an extensive morale-boosting tour of factories and production facilities. Before departing Molesworth on January 20, 1944, however, the personnel of the 303rd were encouraged to write messages on the airframe for "the folks back home".

The American tour covered some 18 cities and was flown by '24577's original pilot, Irl Baldwin, and several other original crewmembers. When the tour ended in May 1944, the aircraft was transferred to USAAF Training Command. In August 1945, still covered in faded signatures, it was put out to pasture with hundreds of other B-17s at Searcy Field, Oklahoma, many of which were purchased by a consortium led by film-flying specialist Paul Mantz in 1946; 11 were retained for film work but the remainder, including *Hell's Angels*, were scrapped.



Why just settle for some ...



... when you can have it ALL?

All print back-issues of *The Aviation Historian* are currently still available via our website's Shop page, from £12.50 inc p&p (UK)

NOT AVAILABLE FROM NEWSAGENTS.

Order from www.theaviationhistorian.com

Not on the web? Call 07572 237737 or write to us and we'll be happy to help





THE HAWKER ASSOCIATION

CALLING ALL HAWKERPHILES!

IF YOU HAVE a connection with any aspect of the group of organisations that made up the prolific Hawker and Hawker Siddeley/British Aerospace companies, or simply have more than a passing interest in all things Hawker — a company that can trace its heritage back to T.O.M. Sopwith and the earliest days of British aviation — then the Hawker Association wants to hear from you! Become a member and enjoy:

- three newsletters a year with contributions from members and a full membership list;
- regular talks and events at the YMCA Hawker Centre in Kingston and group visits

Membership is only **£5 p.a.** For more info visit:
www.hawkerassociation.org.uk



ROYAL AERONAUTICAL SOCIETY
2014 • CELEBRATING 150 YEARS

SELECTED FORTHCOMING LECTURES & EVENTS

8 September **Birmingham Branch Lecture**
The Lockheed SR-71 Blackbird *Col Rich Graham*

14 September **Preston Branch Lecture**
The Early Years of the MRCA/Tornado Development Programme *Dave Ward*

14 September **Brough Branch Lecture**
Training The Pilots Of The Shuttleworth Collection *Roger "Dodge" Bailey*

15 September **Cambridge Branch Lecture**
Flying the F-4 Phantom in Vietnam as a Wild Weasel Pilot *Col Rich Graham*

19 September **Historical Group Conference**
The Spitfire at 80: Fresh Perspectives on an Iconic Fighter *Various speakers*

3 October **Cranwell Branch Lecture**
The Rise of the Bomber *Greg Baughen*

www.aerosociety.com/events

In the Land of



Black Gold

In the summer of 1957 Silver City First Officer **KEN HONEY** was plying his trade on Bristol Freighters between the Kent coast and France when an opportunity arose to take a two-year posting to the rather more exotic climes of the Sahara, where the company was fulfilling the flying requirements of the many oil exploration companies then prospecting in Libya. We join Ken as he prepares to depart for Africa . . .



One of several Douglas DC-3/C-47s operated by Silver City in Libya sits in the shadow of the classic adventure-book fort at Sebha in the country's central Fezzan region. Rebuilt in the 1920s during Italy's colonisation of Libya and named Fort Elena, the imposing building was captured by Free French forces in January 1943 and renamed Fort Leclerc.



TOP Locals crowd around a Silver City DC-3 being refuelled at Kufra during one of the author's visits to the remote oasis during 1957–59. The local schoolchildren were fascinated by the huge machine, none of them ever having seen an aircraft before.

SILVER CITY AIRWAYS is most frequently remembered as the airline that flew passengers and cars from the south coast of Britain to the Continent during the 1950s and 1960s. The company also undertook a number of much less-well-known operations, however, including ferrying aeroplanes worldwide and providing aircraft services. In 1957 a base was set up in Tripoli, Libya, to cater for the transport needs of oil companies. Oil exploration in the region was getting under way and German company Oil Field Supply Ltd chartered Silver City to fulfil its flying requirements.

We were contracted to fly for all the major oil companies involved with oil exploration in the region. Oil would not be found in Libya for another two years, so our work mainly involved transporting geologists and supplying seismic parties, which ranged all over the country, sometimes as far down as the Chad border; later there were drilling sites to supply.

Heading south

I was flying as a First Officer on Bristol Freighters based at Ferryfield on Dungeness Point in Kent at the time and decided to volunteer for a two-year posting. Following a hastily arranged Douglas DC-3 rating, my wife and I flew to Tripoli in July 1957. The Libyan capital was a known quantity to me, as I had nightstopped there with a previous company, and it was where my wife and I had spent our honeymoon two years earlier.

“Hoppy” Hopkins, the Managing Captain, and Capt Doug Phillips were the first pilots in the build-up of permanent crews. I was crewed with Doug, so we got down to a close study of the job in hand, with



LEFT The author (left) and Capt Doug Phillips in front of some typical accommodation during one of their flights in support of oil and water exploratory work in Libya. Within a matter of months, Phillips had been tragically killed in the crash of Twin Pioneer G-AOEO.

BELOW Former Africair Douglas C-47A ZS-DDC is prepared for another flight in Libya. The author explains: "I found out several years later that 'DDC had been operated by Silver City in 1946 with the British registration G-AIRH, but we certainly had no idea of that at the time'".

navigation as the first thing to sort out. It would have to be strictly dead-reckoning, because, once out of range of the coastal non-directional beacons on the journey south into the desert, there were no aids. Fortunately all our aircraft were fitted with RAF wartime drift sights so it was possible to observe the drift on any heading.

The basis of the unit was a powerful magnifying glass in a frame aligned with the airframe that showed the movement over the earth's surface directly below the aircraft. Fitted above this small display was a transparent cover with spaced parallel lines that could be rotated until objects at ground level were seen to be moving parallel to the lines. The drift was then read off a small scale on the rim of the unit. We flew a magnetic heading to coordinates on a Mercator's Chart and applied a drift correction every 10min. In general, the weather was quiet over the desert most of the time with a steady wind, so our navigation was very accurate.

On early trips, what was initially thought of as a featureless desert slowly came alive with sand-sea areas, small escarpments, different-coloured sand and the odd track, all of which helped us. To me desert flying was fascinating. We

flew over the whole of Libya by means of this well-known but old-fashioned system of dead-reckoning navigation. The topographical maps for Libya at the time were far from accurate but we did use them to record our own observations for future reference.

When I arrived in Tripoli, DC-3 ZS-DDC (c/n 12445) had recently been leased from South African operator Africair, which used it to transport mineworkers. A weight-reducing exercise had been completed on the aircraft by removing the heater and the autopilot, and the heavy-duty cabin floor had been replaced. The aircraft was indeed lighter but we had mixed feelings about the removal of the autopilot.

Two's company

The flying was always varied, as we supplied a number of small mobile surveyors and seismic camps. We also flew frequent surveys, sometimes down by the border with Chad. Most of the drilling going on at the time was for water, oil not being found until 1958. Esso named its first drill camp "Frost Field" after one of our captains, Alan Frost, who made endless flights from Tripoli when the camp was set up.



Douglas DC-2 ZS-DFX originally joined Swissair as HB-ITO in February 1935, serving with the airline until it was sold to South African operator Phoenix Airlines in the summer of 1952. It was then acquired by the Astra Aircraft Corporation and operated by the Basutoland Railway Administration, before joining Silver City's Libyan fleet in 1957.



To my amazement at the time, a DC-2 had also just joined the fleet. This, HB-ITO (c/n 1322), had originally been acquired by Swissair in February 1935, but, now registered ZS-DFX, had been flown up from South Africa by Captain "Boots" O'Reilly. The South African authorities gave us a dispensation to fly the aircraft on the strength of our British DC-3 ratings. I found this to be a mixed blessing. On the plus side we did not have to take a British Air Registration Board (ARB) technical exam, but on the minus side there were no engineering notes and not a lot was known about the aircraft. We did have a slim manual from the Swissair days — but it was written in German.

Later in 1957 the DC-2 operations were temporarily halted by an unfortunate accident. An aircraft was being run up in front of a French-registered DC-3 that had been parked with brakes off and without chocks. The DC-3 was blown on to the DC-2's tailplane, with the propeller of the former's port engine taking a sizeable chunk out of the latter's tailplane. The company mounted a worldwide search for an elevator, eventually locating one in Finland. Ron Townsend, in charge of maintenance, still had engineers who could sew and dope fabric, and they produced a beautifully-made replacement.

We didn't find too many problems with flying the DC-2, certainly not the sort of the difficulties that Ernest K. Gann highlighted in his book *Fate is the Hunter*, which we all read a few years later. I suppose we were lucky to have flown the DC-3 first instead of the other way around.

I was never involved with an engine failure after take-off while flying with the DC-2. It would have been a busy time. The only way to establish a climb with a failed engine would have been to raise the undercarriage and jettison some fuel from the main tanks. I remember rehearsing this several times. I later read in



ABOVE *Ouch! The tailplane of DC-2 ZS-DFX after its close encounter with the port propeller of a runaway DC-3. It was repaired and continued to fly with Silver City until it was acquired by French company Airnautic, with which it operated from Nice as F-BJHR. The hardworking DC-2 was withdrawn from service in the autumn of 1961 and was finally scrapped in 1964.*

an article that undercarriage retraction on the DC-2 took some 25sec — this must have been the "factory fresh" time, as our DC-2 took much longer, well over a minute. Any relaxation in pumping or easing on the selector during the retraction would mean a freeze, followed by free fall of the undercarriage and then having to restart the whole procedure again. When the undercarriage retraction was complete an extra hand was required to select the DC-3-type floor lock before releasing the pump pressure.

Fuel calculations were sometimes a challenge, as the main tank gauges were calibrated in US gallons, one auxiliary tank in ¼ths and the other one in litres — and the bowser delivered fuel in imperial gallons.

The Twin Pin catastrophe

On December 4, 1957, Scottish Aviation Twin Pioneer G-AOEO arrived in Tripoli to perform demonstration flights for Esso and other companies. Captain Roy Smith was in command, accompanied by David McIntyre, Managing Director of Scottish Aviation, plus two more



ABOVE The wreckage of Scottish Aviation Twin Pioneer G-AOEO in the Libyan desert shortly after its crash in December 1957. **RIGHT** The forlorn sight of the Twin Pin's almost-complete port wing some 100yd from the main wreckage. The forward tube of the V-brace structure holding the lift strut to the outer panel of the wing had failed owing to metal fatigue.

passengers. After a rest day, flying commenced on December 6, when local flights were made carrying Esso and Silver City personnel. The plan was that during each Twin Pin flight one of our small team of pilots would fly aboard as navigator. The aircraft was housed in the Silver City hangar as we were hosting its stay.

On December 7 Capt Smith, with Silver City's Capt Doug Phillips as navigator and passengers David McIntyre, Mr Johnson (a senior Esso manager) and Mr McCrimmon from a geophysics company, boarded the aircraft to fly to the Esso camp at Hasy 'Atshan, 345 miles (555km) south of Tripoli. After its arrival and the completion of a local trip, the Twin Pin then took off for the return flight to Tripoli with the same four passengers and crew, with an estimated time of arrival (ETA) of 1800hr. However, nothing more was heard from this flight.

Overnight, the air traffic control centre co-ordinated all the searches and checks required, including a search-and-rescue plan if needed, for the following morning. At first light on Sunday, December 8, a DC-3 checked all the landing sites along the planned route, but there was no sign of the Twin Pioneer. By mid-morning a large fleet of aircraft had been assembled and a major search, well organised by the USAF based at Wheelus Field, was started. The Americans conducted a creeping search along the route to Hasy 'Atshan with a number of Grumman



Albatross amphibians, along with several C-47s and a C-54 with paramedics aboard if required.

To work alongside Silver City's DC-3s, the RAF flew in an Avro Shackleton from Malta, completing an impressive fleet. Then, just before 1600hr, pilot Casey Boss came on the R/T reporting that he had found the crash site. Casey was flying a Percival EP.9 some 85 miles (137km) north of Hasy 'Atshan, and reported that he was landing to investigate. Shortly afterwards he was airborne again and confirmed that there were no survivors. The loss of Doug was a sad time for our small community.

On December 9 I was crewed with Capt Jan Van Der Torren and we flew DC-3 G-ANLF to Nahia Neige, the nearest landing strip to the crash site. Our passengers were senior Scottish Aviation personnel who had flown out overnight, including Wg Cdr N.J. "Capp"



ABOVE Named City of Guildford in Silver City service, C-47B G-AMZB (c/n 26980) was acquired by the company in October 1957 and is seen here on change-over day at one of the many oil camps. **LEFT** A young refueller and his companions pose for a photograph at Kufra. The refuelling process required care so as not to contaminate the precious fuel with dust and sand.

Capper, chief test pilot, and senior design and engineering staff. At the first view of the crash site it was quite obvious what had happened; one very complete-looking wing lay on the sand about 100yd (90m) from the main wreckage. It had become detached during flight. The main wreckage area was very small, indicating that the remainder of the aircraft had dived at great speed into the sand, leaving the crumpled tailplane on top of this sad pile.

We knew there had been a metal-fatigue problem in the wing structure on the Twin Pioneer but thought that it had been cured by the modification programme. It turned out that "Echo Oscar" was the only unmodified aircraft, but not everyone in our group, including Wg Cdr Capper, knew this. At the time it appeared that the senior engineers had allowed this unmodified aircraft to fly on this tour, but some

years later I learned that this was not true. The engineering department was very much against the flight taking place, but was overruled by David McIntyre.

After a nightstop at an Esso camp we flew back to Nahia Neige, collected the bodies and took them on to Tripoli. On December 12 I went back to Nahia Neige, again as navigator, with Capt Kemmel and his crew aboard Scottish Aviation's DC-3, G-AMPP, to collect various aircraft parts to be taken to Prestwick.

Desert life

Daily life in Tripoli was quite pleasant. We worked hard, flying at a rate of just over 800hr a year, which was very active for the type of flying we did, sometimes up to six sectors a day around the desert. We flew from the pre-war airport at Castel Benito (renamed RAF Idris in 1952), situated about ten miles (16km) inland from the coast. The airfield had originally been constructed by Mussolini to be outside the range of the naval firepower of the day. Our aim was to get airborne at 0600hr, sometimes earlier. So, with a 14-mile (23km) drive to the airport, this meant an early start to the day.

The UK had played a strong part in establishing Libya's independence in 1951, so the Brits were welcome in the country — indeed, it was the only country I can think of in the Middle East where we *were* welcomed in



ABOVE *The author holding a wartime relic; an anti-personnel bomb found at one of the many ammunition dumps abandoned in Libya. LEFT* *Some might say the only way to travel by helicopter — one of the more unusual tasks for Silver City was the transporting of helicopters to remote strips, including Bell 47 N136B, whose seats are being used to good advantage here!*

those days! There were two clubs that British expats belonged to — the Beach Club and the Elizabethan Club, where all the traditional events of the calendar year were celebrated.

Tripoli still had the appeal of a pre-war Italian colonial town, with some good shops and restaurants, but with a feeling that change was coming. Gaddafi was still a 15-year-old schoolboy at that time, and of course we had no idea of the changes that he would bring to Libya.

Our daily flights were varied and interesting with the odd unusual trip, such as the day we were tasked with picking up a team from one of the camps to fly them to an unused wartime landing ground. After landing, the team boss remarked that it would be wise to take off along the track we had made during our landing run, as he and his German bomb-disposal team had come to clear the explosives in the area!

We often flew nightflights from a camp back to Tripoli, which was quite straightforward with the navigation aids available at the latter. However, we once had to make a nightflight 1½hr south into the desert to a camp for a medical callout. Fortunately it was a calm night, as we were unable to see anything through our drift sight, so navigation was limited to flying a magnetic heading. We asked for the camp chief to switch on his lights 30min before ETA but this was limited to a few small lights and the headlights of four Land Rovers. We decided that this was one of our really lucky trips when

a faint glow of lights appeared off to port a few minutes before ETA. Then two vehicles were placed wide apart with headlights trained on the touchdown point.

Flying around the circuit was difficult as there was no horizon and, as always, we had no accurate height readout. The ground-level pressure to set the altimeter was always guesswork but in daylight with the surface in sight this was not a problem. After we had made a longish flat approach one of the vehicles began to move away, so our only reference point quickly gave a different picture. Another night landing to remember!

One morning we were approaching a camp at around 5,000ft (1,500m). The sun had just risen. There was a stiff breeze and rising sand. Although we could see the ground, visibility would be very poor in the circuit. My skipper gave me a quick brief on the approach he intended to make: maintain height, fly the landing heading until the touchdown point passes beneath the nose, then close the throttles. As the speed decayed, the undercarriage was selected down, then flaps applied incrementally until speed allowed full flap. By then the rate and angle of descent was considerable but a low safe speed was easily maintained. I thought of the training captain who quite rightly told me to “evaluate your aircraft!”

The touchdown point was still firmly in the windscreen, where it stayed until landing. I

"After landing, the team Boss remarked that it would be wise to take off along the track we had made during our landing run, as he and his German bomb-disposal team had come to clear the explosives in the area . . ."



was thinking of plugs oiling up and cylinder-head temperatures dropping, but a short burst of power sorted that out. I was pleased to see a little power used during the roundout and all worked very well. My captain told me that he had been trained to fly this approach on an Avro York in the RAF for a special operation that he was ultimately not called on to perform, and he had never been given any idea what the operation might be.

At some of our destinations in the middle of the Sahara the engine temperatures would become very high. So after landing we positioned the aircraft at the starting point for the next take-off. After starting up, we did not run up the engines, just performed a quick magneto check as the power came up. After one such hot and very heavy take-off the starboard engine ran down. Fortunately, the undercarriage had retracted but this was the worst possible time for a failure; if the ground had been more suitable we would have landed straight ahead. After the prop-feathering drill I then very carefully set up maximum continuous power on the port engine while trying to keep my gaze away from the oil and cylinder-head temperatures, which were all above limits.

In spite of some very smooth handling, the aircraft was not climbing and, worse still, the captain could not hold it straight, even with the allowed bank. The only way out was to reduce power on the live engine — it was very much

ABOVE *Silver City's C-47/DC-3s were more than able to cope with the lack of formal facilities in Libya, the Sahara presenting no shortage of makeshift runways for the rugged, dependable Dak. Here C-47B G-AMYX (c/n 33042), named City of Rochester in Silver City service, is greeted by a caravan of Land Rovers at the landing ground at Waw an-Namus in southern Libya.*

a day for positive thinking — which I did very gently in small increments until we held straight. It took some time before we were able to make a low flat circuit back to land, still with the temps and pressures well above limits. During my career I experienced the occasional rare engine failure, but never under such limiting conditions.

A visit to Kufra

Kufra, in the south-eastern Cyrenaica region, had featured in a number of books about the British Army Long Range Desert Group's wartime exploits around the oasis, and I had always hoped that one day someone would want to fly there. I was crewed with Capt Chas Hellewell in DC-3 G-AMYX for what was to be the first of many trips to Kufra for our unit. We were told that the old airfield could still be used but nobody knew the state of it.

Some 742 miles (1,195km) south-east of Tripoli, Kufra was an area quite unknown to us. Needless to say there was no weather information. We planned a point of no return, which was unusual, and carried enough return fuel on board. As there was no accommodation



MAP BY MAGGIE NELSON

A joyful photograph showing the reaction of the local schoolchildren at Kufra to the arrival of G-AMYX. Note the wrecked pre-war Nissen-style hangar in the background, by 1958 one of the few mementoes of the original Buma airfield, built by the Italians after the nation's capture of the strategically important Kufra in 1931.



available in Kufra, we carried camp beds. The day before departure I noticed that the engineers were varnishing the legs of the beds. I was told the varnishing was to prevent scorpions from climbing up the bed legs — I quickly realised that the painters were quite serious!

The planned flight time was 5hr 25min, which seemed to work out as we had hoped. Nearing our ETA we were discussing the square search to be used when a palm tree appeared in the haze. This was the start of Kufra Oasis. It turned out to be much smaller than expected. Fortunately, the pre-war Italian hangar wrecked by General Leclerc and the Free French forces in 1941 was visible in the haze — a welcome sight. But we were unable to see any boundary markers for the landing ground.

After landing, we found that most of our landing run had been outside the airfield. As soon as the propellers had stopped a crowd of small boys ran out and walked all around the aircraft. We decided to let them wander around, as it transpired that this was the first aircraft they had ever seen. I spoke to an Arab standing nearby who looked uneasy, and found that he was the group's schoolmaster from their school situated on the airfield boundary. He was an Egyptian who spoke English and was expecting to be told off at any time by the crew. He said that this would not have been allowed in his country. I replied not in our country either, but we agreed that Kufra was different. We were met

by the team of geologists, which organised food from the back of a Land Rover. We slept under the wing of the Dak, hoping that the varnished bed-legs would keep the scorpions at bay!

On previous survey flights in the Fezzan, Libya's south-western region, I had found that navigation could be difficult, as the reason for the flight was to allow geologists an unrestricted view of the area to be surveyed. To do this they needed to make approaches from different headings, return to certain points and in general just fly around. To deal with survey navigation I was now well practised in using a sheet of graph paper covered with Perspex and drawing headings using a protractor and chinagraph pencil. The start point was a position on the track to the survey which would be our aiming point for the return flight. It was a basic navigation system, but it worked and brought many a smile to our geologists, who were well aware of our task.

I met the Kufra schoolmaster on subsequent trips, always with questions for him. He told me that each night in Kufra someone was stung by a scorpion. At my request, he enquired about the number of aircraft that had landed at Kufra since the war and it was concluded that our aircraft was the third. The Luftwaffe had raided Kufra on a number of occasions and one bombing raid is recorded in a number of books. On September 25, 1942, eight Heinkel He 111s bombed the oasis, with up to five being shot down (the



number varies according to the source). The wreckage we found of an He 111 just north of Kufra could be from any one of the raids. Although this crash was recalled by some locals, none remembered exactly when it happened.

We made a number of flights to Kufra and performed surveys down to the Chad border. On one trip we found a Bristol Blenheim Mk IV still standing on its undercarriage just north of Kufra. Nobody knew very much about it at the time, but later I found that a great deal had been written about this machine's fate. It was one of three from No 15 Sqn SAAF that had set out from Kufra on a navigation familiarisation flight on May 4, 1942. The flight became disoriented and had to make a forced landing, resulting in a final death toll of 12 crew members from lack of food and water. It was one of many reminders that continued to drive home to us the message about navigating and being well equipped for emergencies in the desert.

In 1959 a Silver City DC-3 crew heading back to Tripoli from the Kufra area found the wreckage of a Consolidated B-24 bomber that had crashed during the war. There were no vehicle tracks around the wreckage, giving the impression that it had remained untouched since it crashed. This turned out to be the case. The DC-3 crew was set up in the cruise and could not spare the extra fuel to take a closer look, so just recorded an approximate position.

There was great interest from the surveyors

on board as they were due to work in that area. Within days I flew back to Kufra with Capt Hellewell. The next day we flew overhead the crash site to obtain its coordinates. We reported our findings to the RAF at Idris and the USAF at Wheelus Field, but no interest was shown at either base. Some time later there was worldwide interest in the story of the B-24, which bore the name *Lady Be Good*, particularly when the remains of the crew — who had parachuted down at night and subsequently perished in the desert — were found.

Meeting "A Fool in the Desert . . ."

In February 1959 the World Bank, part of the United Nations system, sent a delegation to Libya on a six-day fact-finding mission, and Silver City was chartered to fly the delegates around the country. Captain Hugh Tubman, Radio Officer Bill Colvin and I flew Dakota G-AOBN to Benghazi to collect the passengers for the trip.

Our passengers were an interesting team, comprising a mix of nationalities who were very secretive as to their mission. We gleaned that it was to assess water exploration and supply to distant communities. We then flew on to Hun in the northern Fezzan before basing ourselves in Sebha, a busy hub for oil exploration work 350 miles (560km) south of Tripoli, for the next few days. Here there was a very basic but sound hotel. Overlooking the landing ground was a



ABOVE LEFT Captain Hugh Tubman (extreme right) awaits yet another meal of couscous at one of the World Bank meetings for which he and the author provided the transport. **ABOVE RIGHT** The Esso man at Sebha is snapped before refuelling a DC-3 at the landing ground overlooked by the distinctive former French Foreign Legion fort.

stunning fort, straight out of the pages of *Beau Geste*, which had been occupied by the French Foreign Legion until a few months earlier. Of great interest to me was an Esso refueller who was able to hand-pump fuel for us. Normally this was the First Officer's job, pumping out of 40gal drums, for which we carried a hand pump and a large funnel with a chamois leather filter on all flights.

We flew day trips to one or two of the major towns that we knew but also to some that were new to us. Our new destinations were Brak, Ubari and Murzuq, which appeared to be established communities living well south of the administration of Tripoli/Benghazi. Needless to say on reaching a small town, the hospitality was considerable, with all the senior residents pressing for a water-grant hearing. Whatever

the time of day we all had to sit down to a large high-quality meal of couscous that at some sittings we ate with our fingers. As we were making up to three visits a day this amounted to a considerable volume of food.

One day we returned to the basic but adequate hotel at Sebha to find that Barbara Toy, the author and solo traveller, was a new guest. Barbara was a slight but tough Australian lady who had written the *A Fool In . . .* series, in which she wrote of her travels to out-of-the-way places. We quickly established that she was no fool. Our senior passenger decided that she would fly with us the next day. Barbara was at the start of another of her solo Land Rover drives, this time to Ethiopia, but was delayed in Sebha owing to problems in obtaining police clearance on through to Chad.

One of the more exotic types photographed at Sebha was Boeing B-17G N5845N, originally serialled 42-102542, which was being used by Philadelphia-based Aero Services Corp for high-altitude survey photography work. It is believed to have been written off in a non-fatal landing accident at Jeddah in 1959.



"When a new landing area was needed, a Land Rover was driven at 50 m.p.h. over the surface, and if the driver remained in his seat, then we could land there . . ."



ABOVE Dakota G-AMYX on the dark sands at Waw an-Namus during a supply visit to a geological team based close to the volcano. Inside the crater lie three small salt lakes and an oasis of rich foliage, creating a startling contrast to the surrounding Sahara. **INSET** The author in the right-hand seat of a Silver City Dakota over Libya.

Another of our adventures involved Waw an-Namus, an extinct volcano in the south-eastern Fezzan region, some 550 miles (890km) south of Tripoli. We flew over the volcano several times during survey flights and between camps in the southern Fezzan. Passengers would often come to the cockpit for a better view, and I hoped that someone would want to fly there. If the light was favourable, the blue lakes and surrounding greenery offered a novel contrast in the near-geographic-centre of the Sahara. We could never decide if the volcano area was inhabited or not. There were signs of an odd field or compound, plus a pyramidal structure which may have been from generations before, as it never rains there.

The trip that I had hoped for finally came up, with Capt Bob Large and I flying down to Waw an-Namus. Geologists working down in that zone needed supplies, and it was decided that the volcano would be a good pick-up point. When a new landing area was needed, a Land Rover was driven at 50 m.p.h. (80km/h) over the surface, and if the driver remained in his seat then this was the signal that we could land there. The area needed to be clear of boulders and big undulations as well. I suspect there was some cheating on this, as we often had a bumpy landing run.

We landed alongside the Land Rover, which was also used as a marker, and were driven up to the edge of the volcano crater for breathtaking views. It was then I remembered that the name Waw an-Namus means "Oasis of Mosquitoes". I learned some years later that fish and crocodiles lived in the lakes.

There are many more stories I remember about our Libyan adventure. One day, an engineer passenger burst through the cockpit door late in the take-off run and closed the throttles. He had seen a heavy bundle of pipes lashed to the aircraft floor slowly moving aft. On other occasions we had arrived at a campsite to find that they had moved on, or that we had set off with the wrong coordinates for the camp, a fairly common occurrence when the teams were mobile and sent their new position back to their headquarters, but word had not yet reached us. Unsurprisingly, we had a great personal interest in finding their new sites as they carried the fuel for our return flight!

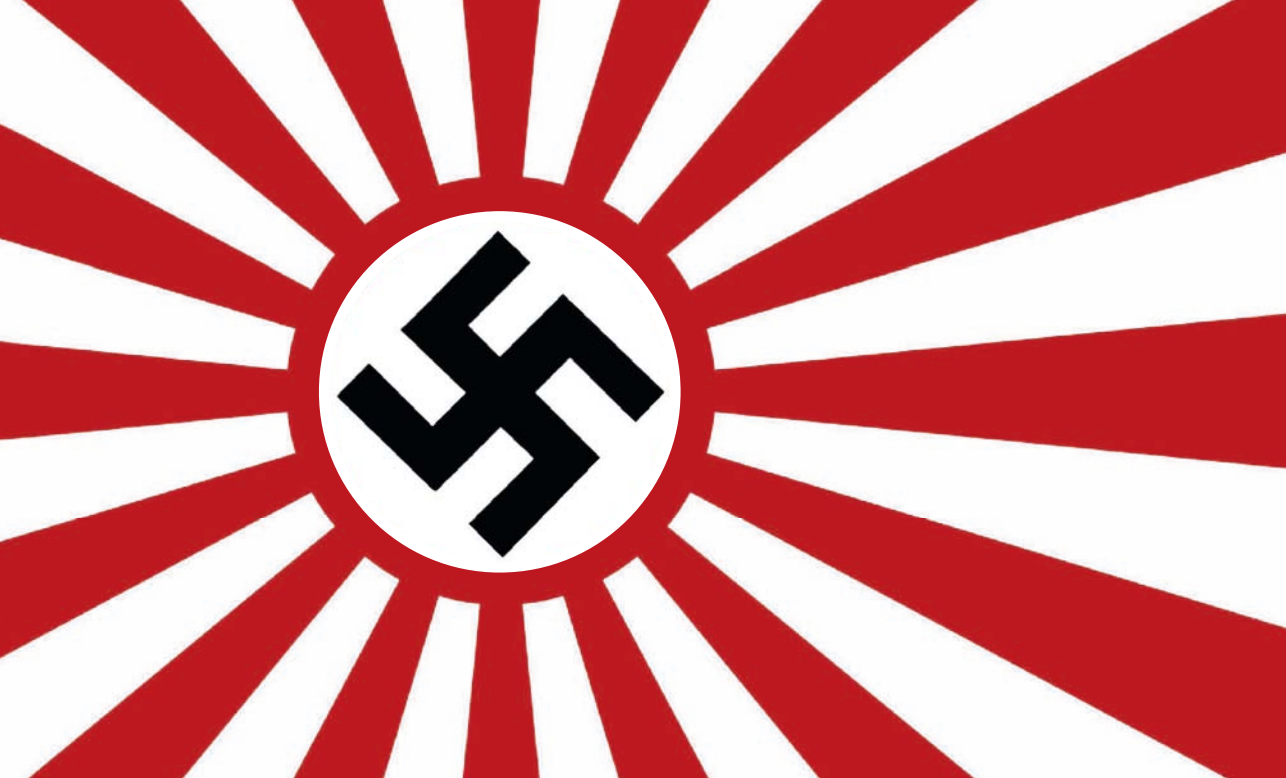
I recall landing at Tripoli at night when a loose camel was on the airfield. We did not see the beast but the aircraft a few minutes behind us made contact, causing a fair bit of damage and killing the unfortunate camel.

Out of Africa

In 1959 our two years was up and the time had come to plan our return to the UK. My wife and I decided to drive our Volkswagen Beetle home, with a day stop in Malta and a ferry trip to Sicily on the way, before zig-zagging up through Italy, Switzerland, the Black Forest and France — where finally, in a fitting coda to our two-year desert stay with the company, we flew on the Silver City car ferry to Lydd.



ACKNOWLEDGMENTS The Aviation Historian would like to thank Silver City specialist Paul Ross for his invaluable assistance with the preparation of this feature



HANDS ACROSS ✠ THE WATER? ●

On September 27, 1940, Germany, Japan and Italy signed the potentially decisive Tripartite Pact, in which the three nations would pool their resources to develop the world's most advanced weapons of war. Or so went the theory. **TED OLIVER** takes an in-depth look at the true extent of technological co-operation between Germany and Japan during 1940–45





A BRIEF ACCOUNT OF the development of Japanese aviation and its early reliance on foreign assistance for aircraft design and manufacture may provide some useful background to this study of the technical assistance provided by Germany to Japan both before and during the Second World War.

Following several years of experience with manned balloons, which began with the first ascent in Japan on May 21, 1877, a joint Imperial Japanese Army (IJA) and Navy (IJN) organisation known as the Provisional Committee for Balloon Applications was established in July 1909. This body also took a keen interest in the various manned powered aircraft being developed abroad. As a first step, two young captains were sent to Europe in April 1910 to gain flying experience — one to France and the other to Germany, each returning to Japan later that year with a purchased aircraft.

Their “official” successful first flights were accomplished in Tokyo on December 19, 1910, when Capt Yoshitoshi Tokugawa attained a height of 70m (230ft) during a 4min flight in his imported Henri Farman biplane, followed later that day by Capt Kumazo Hino in his Hans Grade monoplane, which flew for some 80sec. The IJA established a military aviation section in April 1911; the IJN, initially in partnership with

the IJA, established its own Naval Aeronautical Research Association in June 1912. From then on, both services went their separate ways in terms of standardising on aircraft types, aero-engines, armament, procurement, combat tactics and the training of pilots and maintenance crews — a state of affairs that persisted until the end of the Second World War.

Between 1910 and 1922 several dozen prototype aircraft were built privately in Japan, based either on foreign designs or conceived locally, comprising monoplanes, biplanes and triplanes using aero-engines imported mainly from France, Germany, Italy, the UK and USA. During the First World War both the IJA and IJN expanded their aviation activities, modernising their equipment with aircraft imported from Europe. During 1917–22 both air arms acquired the services of foreign military teams to assist in training their personnel, initially from France (for the IJA) and later from the UK (for the IJN).

INTER-WAR GERMAN ASSISTANCE

Beginning in 1922, the services of several noted aircraft designers, engineers and test pilots were secured from Germany to assist the newly-established aviation divisions of Kawasaki, Mitsubishi and Nakajima. Foremost among these German experts were engineer Paul Ludwig (who worked in Japan during 1923–25) from the

OPPOSITE PAGE *The sole Focke-Wulf Fw 190A-5 imported into Japan arrived in the late summer of 1943 and was tested against Japanese fighters at Fusa airfield, near Tokyo. It was highly rated by test pilots, but was not selected for production in Japan. TOP* The Führer, Adolf Hitler, and Japan's Prime Minister from 1941, Hideki Tojo.



ABOVE An example of the German influence on Japan's pre-war fighter aircraft, the Kawasaki KDA-5 (Army Type 92 Fighter in IJAAF service) was designed by German expat Richard Vogt in 1930. The single-seat biplane fighter made its maiden flight the same year and in tests set a new Japanese speed record of 173kt (200 m.p.h./320km/h).

Rohrbach Metall-Flugzeug GmbH, who designed aircraft for the Yokosuka Naval Air Arsenal; Prof Dr-Ing Carl Wieselsberger (during 1922–26) from the AVA Göttingen, who supervised the design and construction of windtunnels for Mitsubishi at Nagoya, the Naval Technical Research Institute at Kazumigaura, the Army Air Technical Research Institute at Tachikawa and the Kawanishi Aircraft Co Ltd (and was also instrumental in building up the Aeronautical Research Institute of Tokyo Imperial University); and Dr-Ing Richard Vogt (in Japan during 1924–34), formerly of the Dornier-Werke GmbH, who was engaged as chief designer and aeronautical adviser at the Kawasaki Aircraft Co Ltd in Kobe before assuming the same post at the Hamburger (later renamed Blohm und Voss) Flugzeugbau in Hamburg.

Other notable German imports included Prof Dr Alexander Baumann, formerly at the *Technische Hochschule* (TH) Stuttgart and in 1914 head of the *Riesenflugzeug* (giant aircraft) design office at the Zeppelin-Werke Staaken GmbH in Berlin, who joined the Mitsubishi Aircraft Co Ltd at Nagoya as chief designer in 1924. Another was Dr-Ing Gustav Lachmann, former chief designer at the Albatros Flugzeugwerke GmbH in Berlin, who assisted the Ishikawajima Aircraft Manufacturing Co Ltd during 1926–29, before going to Handley Page Ltd in the UK.

Also finding work in Japan, Prof Dr Theodore von Kármán worked for the Kawanishi Aircraft Co Ltd during 1927–29. Born in Budapest,

Hungary, he obtained his PhD in 1908 at Göttingen University, where he was a *Privatdozent* (lecturer) during 1909–12. He was Director of the TH Aachen during 1912–29 and consultant to the Junkers Flugzeugbau from 1912 to 1928. He also worked with the Luftschiffbau Zeppelin during 1924–28. In 1927, von Kármán designed the Kobe windtunnel in Japan, and later went to the USA.

During 1926–33 aircraft designer and manufacturer Prof Dr-Ing Ernst Heinkel, his chief designer Dr-Ing Karl Schwärzler and test pilot Carl Clemens Bücker provided assistance in designing, manufacturing and testing Heinkel aircraft specially designed for the Aichi Watch & Electric Machinery Co Ltd, which from 1938 also built the Daimler-Benz DB 601 engine under licence at its Atsuta plant in Nagoya. Other prominent designers and engineers from France and Britain also spent time working in Japan during this crucial period of development.

Numerous Japanese students were sent abroad from Japan to Germany and other countries to gain valuable experience in foreign aircraft industries. The aforementioned German specialists also trained personnel in their respective companies, many of these students later distinguishing themselves in producing aircraft which were to prove equal, if not superior, to those of their adversaries in World War Two. Unsurprisingly, many of the resulting Japanese civil and military aircraft displayed their foreign influences, but by 1932, when Japan's aircraft industry had become



ABOVE Germany's Foreign Minister Joachim von Ribbentrop is watched by Japanese ambassador to Germany Kintomo Mushakoji as the former signs the Anti-Comintern Pact in Berlin on November 25, 1936. The aim of the pact was to fight the spread of international communism, with Italy signing to form the "Axis" powers in 1937.

largely self-sufficient, original design features were becoming more noticeable.

At the same time, civilian and military aircraft from several countries, including France, Britain and the USA, were imported into Japan. Many more were of German origin, and included designs by Bücker, Dornier, Fieseler, Focke-Wulf, Heinkel, Klemm, Junkers and Messerschmitt. Manufacturing licences had been negotiated for some, but only one German aircraft type and three aero-engines entered licensed production.

THE GERMAN PRE-WAR INFLUENCE

German military aircraft imported into Japan from the mid-1930s until mid-1941 were products of the following companies, listed alphabetically:

Bücker

In 1937 three examples of the Bü 131 Jungmann were imported, followed in 1938 by another 14 and a single Bü 133 Jungmeister, with one more Bü 131 arriving in 1939. A Japanese variant of the Bü 131B basic trainer entered production as the Kokusai Ki-86 for the Imperial Japanese Army Air Force (IJAAF) — 1,087 built — and as the Watanabe (later renamed Kyushu) K9W1 for the Imperial Japanese Navy Air Force (IJNAF) — 339 built — both variants powered by a licence-built 110 h.p. Hirth HM 504A-2.

Fieseler

One example of the Fi 156 Storch (Stork) was

purchased by Japan in 1941, but the indigenous and similar Kokusai Ki-76, equipped with a more powerful radial engine, displayed superior performance, so the Fi 156 was not put into production.

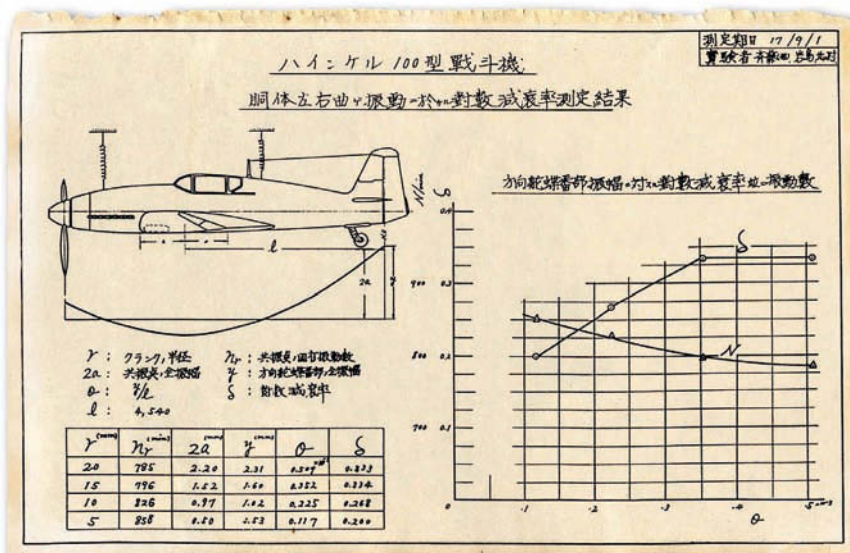
Focke-Wulf

On April 1, 1939, Germany's *Reichsluftfahrtministerium* (RLM — Ministry of Aviation) drew up a programme for the manufacture of various aircraft to be exported by June 1940. This included six Fw 200s for Japan, which had expressed interest in this aircraft in the bomber role, offering the manufacturer a development contract with deliveries to start in 1940; but after the outbreak of war this plan was cancelled.

Heinkel

The Japanese showed pre-war interest in the He 50, He 66, He 70, He 74, He 100, He 111, He 112, He 116, He 118 and He 119. In addition to one He 70 (designated LXHe1 by the Japanese) and one He 74B (KXHe1) purchased in 1936, deliveries made in 1937 included the first four He 112B-0 (A7He1) fighters of a total of 30 ordered, and three He 118s (DXHe1).

Delivery of the remaining 26 He 112s followed in 1938, together with two He 116s, which were given the Japanese civil registrations J-BAKD and J-EAKF. An order had also been placed in 1937 for no fewer than 70 He 111 bombers, but after ten had reportedly been made ready (but probably not



LEFT An original Japanese technical document, dated September 1, 1942, detailing the results of a series of airframe vibration tests of one of the three Heinkel He 100D-0 sentōki (fighter) aircraft delivered to Japan in May 1940. The blisteringly fast Daimler-Benz DB 601-powered He 100 became the inspiration for Japan's Kawasaki Ki-61 Hien fighter.

delivered), supplies were halted, whereupon the Japanese purchased 80 Fiat BR.20 Cicogna (Stork) bombers from Italy in exchange for soya beans, as a stopgap in 1938. These saw limited service in the war with China but proved unsatisfactory and were withdrawn two years later.

In 1940 three He 100D-0s (designated AXHe1) and two He 119 prototypes (V7 and V8) were delivered, the He 100 serving as a pattern for the Kawasaki Ki-61 Hien (Swallow) fighter and the He 119 for the Yokosuka R2Y1 Keiun (Beautiful Cloud) reconnaissance aircraft.

Junkers

Japanese interest in Junkers designs encompassed the Ju 86, Ju 87, Ju 88, Ju 160 and Ju 188. One example of the Ju 86 (designated LXJ1) was purchased in 1937, followed by a Ju 87A in 1938 and a Ju 88A-5 in 1940, but none was put into production. Design drawings of the Ju 188 were furnished later.

Messerschmitt

Of interest to Japan were the Bf 108, Bf 109, Bf

110 and Me 210. The first Messerschmitt to be purchased was a Bf 108B (registered J-BACC). Of the order for three Bf 109E-7 fighters in 1940, two went to the IJAAF and one to the IJNAF in 1941. Although slightly ahead of the story thus far, during 1942–43 two Bf 109G-6 and three Me 210A-1 fighters were delivered. Both types were test-flown by the IJAAF.

The aircraft, aero-engines and missiles that became of interest to the IJAAF and IJNAF later in the war, including the latest German jet- and rocket-powered types, will be dealt with later in this narrative.

THE TRIPARTITE PACT

On the global political scene, a number of momentous events had taken place by the mid-1930s, with a number of extremist governments assuming power. As far back as October 1922, Benito Mussolini, known as *Il Duce* (the leader), and his fascists had gained power in Italy, followed by Nazi Reichskanzler Adolf Hitler in Germany in January 1933. General Hideki Tojo

Clearly showing its German heritage, the Kawasaki Ki-61 Hien (Allied reporting name Tony), powered by the same company's Ha-40, essentially a licence-built DB 601, was the only inline-engined Japanese fighter to see extensive operational service during the Second World War. TAH ARCHIVE





would take power as Japan's Prime Minister in October 1941. These three countries, with their leaders all intent on expanding far beyond their national borders, soon became aligned with one another through a series of pacts.

On November 25, 1936, the Anti-Comintern Pact was signed between Germany and Japan, Italy joining the Pact on November 6, 1937, with the status of a full original signatory. The Pact contained a secret political agreement — but not a military one at that stage — which specified that if one party was attacked, the others should not in any way enhance the Soviet Union's military capability, Japan's principal aim at that time being to secure its northern borders with Russia in Japanese-occupied Manchukuo (Manchuria).

Much to the Japanese government's surprise and annoyance, since it had not been previously notified of such negotiations, it learned only two days beforehand of the Treaty of Non-Aggression between Germany and the USSR signed by Vyacheslav Molotov and Joachim von Ribbentrop in Moscow on August 23, 1939. With grave reservations and hesitation on the part of the Japanese, albeit later assuaged to some degree by swift German victories in Europe following the invasion of Poland on September 1, 1939, the much-vaunted Tripartite Pact between Germany, Italy and Japan was finally signed in Berlin on September 27, 1940, for a proposed duration of ten years. This was followed by the five-year Soviet-Japanese Neutrality Pact of April 13, 1941, again aimed at securing Japan's northern borders, particularly in Manchuria, against possible Russian intervention in Japan's continuing war since 1931 on the Chinese mainland.

In Hitler's Führer Directive (*Weisung*) No 24 of March 5, 1941, entitled *Co-operation with Japan*, is to be found, among various other details, the following tenets:

ABOVE *Three Messerschmitt Bf 109E-7s were imported into Japan and tested extensively by both the IJAAF and the IJNAF. One of the Navy test pilots stated that he found the Bf 109's cockpit narrow and cramped, although its acceleration in a dive was exceptional. Unsurprisingly, of the German fighters tested by Japan, the Fw 190 was deemed the best.*

"(1) The co-operation established by the Tripartite Pact of 27.9.40 must have the aim of inducing Japan to act as soon as possible in the Far East. Strong British forces would thus become occupied [and] the focal point of interest would be diverted to the Pacific. The chances of success for Japan would be all the more promising the earlier it is engaged, in view of the undeveloped readiness for war by its opponents.

"(2) For the preparation of co-operation it is necessary to strengthen Japanese fighting power by all means. For this purpose, the branches of the OKW [*Oberkommando der Wehrmacht* — Supreme Command of the Armed Forces] should accommodate in a generous manner the wishes of the Japanese for information on German war- and fighting experiences and provide support of a war-oriented and technical nature. Mutual co-operation is desired but should not be allowed to make negotiations more difficult. Those Japanese requests which would have an early effect on the conduct of war are naturally to be placed foremost.

"(3) Agreement upon mutual Operations Plans are delegated to the OKM [*Oberkommando der Marine* — German Naval High Command]. These concern a) merchant shipping influence on Japanese action; b) the supply of raw materials to Germany by Japan; c) the capture of Singapore as a precursor to the overall war success of the Tripartite Alliance.



“(4) The Military Commissions to be established in accordance with the Tripartite Pact are solely to discuss such matters which are of equal concern to the three participant powers. Economic warfare falls primarily in this category. The determination of details is a matter of the Chief Commission, with the concurrence of the OKW.”

The opening of unannounced hostilities in the Pacific theatre by Japan against Great Britain, France, the Netherlands and the USA on December 7, 1941, long-since desired and welcomed by Japan's German and Italian partners to divert American attention away from Europe, also led to swift initial Japanese victories in occupying former colonial territories in the Far East. In keeping with the spirit of Article 3 of the original Tripartite Pact (although they were not compelled to do so, and fully aware that the might of American war production would soon outstrip their own, with disastrous consequences), Germany and Italy declared war on the USA on December 11, 1941. On the same day, Germany proposed a draft agreement that the three countries should not lay down their arms nor agree to an armistice or peace treaty with either Great Britain or the USA.

WORKING OUT THE DETAILS

On December 15, 1941, Japan drew up a counter-proposal for a military agreement between the three nations which, among other articles, suggested that the partners — the OKW and the Imperial Japanese Navy — establish radio communications and an air link between the two countries, as well as re-establish commercial sea

ABOVE *The signing of the Tripartite Pact between Japan, Italy and Germany in the large reception hall of the New Reich Chancellery in Berlin on September 27, 1940. Seated nearest the camera is Japan's ambassador to Germany Saburu Kurusu; to his left sits Italian Foreign Minister Galeazzo Ciano, with the Führer next to him presiding over the ceremony.*

lanes with mutual co-operation on the subject of sea transport via the Indian Ocean.

The first meeting of the proposed Military Commission took place in Berlin on December 15, at which the extent of military co-operation, among other topics, was tabled for discussion. This included the geographical demarcation of zones of operation, joint military operations, the exchange of information, the establishment of military radio communications, military transport flights and the re-establishment of sea traffic routes. A Japanese request to establish a Germany—Japan direct air route was turned down, as *Reichsmarschall* Goering regarded it as impossible under the prevailing situation. [*The Axis wartime air links are the subject of a forthcoming in-depth TAH series — Ed.*]

A military agreement was signed by the three countries on January 18, 1942, and included the Japanese wish to establish a joint Technical Commission which could meet as soon as possible, but it appears that following the first opening session of the Military Commission on February 24, 1942, only two or three further sessions took place until the beginning of 1943.

On March 7, 1942, the Japanese drew up a draft agreement on economic co-operation between Germany and Japan, the former in turn following with its own proposals on June 2, 1942, for a secret



LEFT Impressed by the unusually configured Heinkel He 119's high speed and long range, the Japanese sent a team of nine technicians from the Naval Air Technical Arsenal at Yokosuka to the Heinkel factory at Marienehe to study the aircraft. Two examples were sent to Japan in May 1940 for testing.

BELOW One of Germany's most dramatic and potentially significant wartime developments was the Messerschmitt Me 163 rocket-powered interceptor, which the Japanese understood could be of immense value against the waves of USAAF B-29 bombers pummeling Japan from mid-1944.

agreement on the same subject, culminating in a final German proposal dated November 8, 1942. A Japanese proposal to include an amendment to Article 1 of this economic co-operation agreement followed on December 10, 1942.

In a meeting held at the *Führerhauptquartier* on October 16, 1942, between German military representatives headed by *General der Artillerie* Alfred Jodl, chief of the OKW's *Wehrmachtführungsstab* (Operational Orders section) and Vice-Admiral Naokuni Nomura, Chief of the Japanese Military Commission in Berlin, and his aides General Banzai and Admiral Tadao Yokoi, the subject of the establishment of a Tokyo—Berlin military air link for the exchange of military personnel was discussed. The Japanese also requested German assistance to supply much-needed machine tools and steel, and, although they were able to supply raw materials in return, pleaded a lack in the quantity of shipping required for transport to Europe.

On January 10, 1943, the German-Japanese Economic and Technical Exchange Agreement was finally put in place, under which trade and technical liaison between the two co-belligerents could take place. The Agreement, in general terms, provided for the mutual exchange of raw materials, military equipment, medical commodities, manufactured products and technical research and development data. Aside from the supply of raw materials to Germany — rubber, tin, tungsten ore, molybdenum, quinine and other products brought by merchant vessels and submarines — the Japanese in turn purchased quantities of special steels, aluminium, lead, platinum, mercury, industrial diamonds, ballbearings and chemicals, which were always in short supply.

Germany considered — quite rightly — that the Japanese had little to offer in the way of advanced technology, and the exchange of technical information became largely one-sided from





LEFT A rare photograph of a Luftwaffe officer, possibly Oberstleutnant Hans Kogler, Kommodore of fighter wing Jagdgeschwader 6, talking with Japanese officers in Germany. Kogler was shot down in his Fw 190 and captured during Operation Bodenplatte on January 1, 1945.

BELOW One of the types demonstrated to the Japanese delegation at Rechlin in June 1944 was the turbojet-powered Arado Ar 234B, two prototypes of which were put into service as high-speed reconnaissance machines that July.

the outset. As a consequence, German military planners were reluctant to co-operate wholeheartedly with their Japanese counterparts, and it was only at the beginning of 1944 that Ambassador General Hiroshi Oshima and his military aides at the Japanese Embassy in Berlin were permitted limited insights into the otherwise top-secret realm of German jet and rocket technology by the *Oberkommando der Luftwaffe* (OKL) and RLM. *General der Jagdflieger* Adolf Galland, for example, recalled that a demonstration for the Japanese took place at Rechlin on June 12–13, 1944, in the presence of *Generalfeldmarschall* Erhard Milch, Armaments Minister Prof Albert Speer and himself, with an Arado Ar 234B, Messerschmitt Me 262A and Dornier Do 335 being flown.

Japanese requests for complete technical data and manufacturing rights for the highly advanced Me 262A and Me 163B aircraft, plus the BMW 003A, Jumo 004B and HWK 500, 507 and 509A powerplants that powered them, as well as technical assistance from German experts, were soon forthcoming. Pioneering missile designer Prof Dr-Ing Herbert Wagner stated that in 1943 and 1944 the Henschel Hs 293 and Hs 294 anti-shipping missiles were also demonstrated to the

Japanese at Garz-Usedom airfield, which led to Japanese interest in obtaining the rights to manufacture these two missiles under licence.

MEANWHILE...

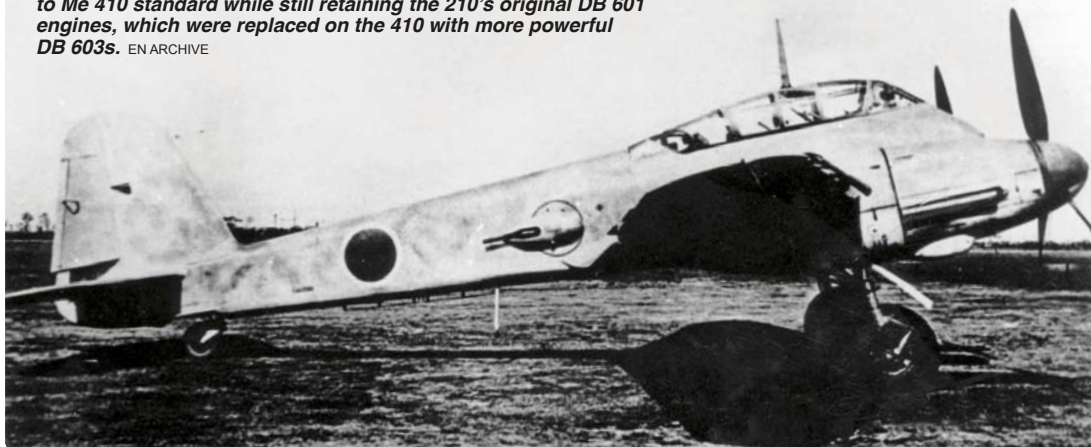
Back in Japan a joint Army-Navy Technical Committee had been established to co-ordinate all German technical material for evaluation by both services, but the counterproductive duplication of enquiries by the IJA and IJN continued. When German military representatives voiced their exasperation in April 1944 at being asked to enter separate agreements with the Imperial Japanese Army and Navy, preferring to deal with only one joint authority, the Japanese High Command agreed in May 1944 that the Navy would assume responsibility for negotiations, presumably because this service had long shown a higher degree of interest and had conducted more research in such developments. Despite this, the Army continued to maintain separate direct contact with their German *Oberkommando* (Supreme Command) counterparts.

Because of the sensitivity of the full information requested, German discussions with the Japanese continued until March 1944, when Goering and

EN ARCHIVE



Three Messerschmitt Me 210A bomber-destroyers were supplied to Japan for evaluation. This example, WNr 2350, was brought up to Me 410 standard while still retaining the 210's original DB 601 engines, which were replaced on the 410 with more powerful DB 603s. EN ARCHIVE



Hitler finally decided that it should be made available to Germany's oriental allies. A letter dated April 1, 1944, from *Staatssekretär* (State Secretary) and RLM *Generalluftzeugmeister* (Chief of Air Procurement) Erhard Milch to Goering, the *Luftwaffe C-in-C*, mentioned that licence agreements should be concluded with the Japanese to enable the manufacture in Japan of the Me 163B and Me 262A and their respective powerplants. Japan requested that Germany provide technical assistance and personnel for large-scale production of these aircraft, and so technical specialists from Messerschmitt and Junkers were selected to be sent to Japan. It was also requested that Japanese technicians receive training in Germany.

From January 1943 until late 1944, in addition to the aircraft mentioned above, the Germans had been supplying aircraft types and design drawings to the Japanese. These were as follows:

DFS

Records state that in January 1943 the Gothaer Waggonfabrik (GWF) delivered three examples of the DFS 230B-2 transport glider to Japan.

Dornier

A sole Do 217 was delivered in 1943 but no production of the type followed. After the push-pull Do 335 was demonstrated at Rechlin to the Japanese in June 1944, their interest was sought in licence manufacture of the Do/Ju 635 — a twin-fuselage long-range reconnaissance variant of the Do 335 — see Junkers entry.

Focke-Wulf

Aside from one Fw 190A-5 delivered in 1943, the Japanese also showed interest in acquiring design data on the Ta 152C fighter in 1944. Included in technical documents taken to Kiel-Wik and prepared for transport by U-boat to Japan in

March 1945 were 75 per cent of the technical drawings for the Ta 152C, as well as drawings for the coupled 28-cylinder four-row BMW 803 radial engine and the GM-1 (liquid nitrous-oxide) and MW-50 (methanol-water) fuel additives, the latter two furnished by Dr-Ing Otto Lutz at the LFA Braunschweig (Brunswick).

Gotha

In April 1943 the GWF became aware of a Japanese request for two examples of each of the Go 242 transport glider and its powered derivative, the Go 244, but as delivery by surface ships became impossible the following year, design drawings of these two aircraft were passed to the joint IJAAF/IJNAF Military Commission in Berlin in the summer of 1944. Japan's early interest in the DFS 230 and Go 242, however, may have formed the basis for the Nippon Kokusai Kogyo Ku-7 Experimental Transport Glider, whose design, similar to the Go 242, was begun in 1942 and which first flew in August 1944. A powered variant designated Ku-7-II, similar to the Go 244, was completed in December 1944 and first flown in April 1945. Both types were envisaged for IJAAF use.

Heinkel

In late 1942 negotiations began for manufacture of the He 177 by Hitachi in Chiba, but with four separate radial engines in place of the two coupled DB 606 units. One He 177A-7 was earmarked for this purpose together with the appropriate jigs and machine tools, but could not be delivered.

Design drawings and data for the He 162A jet fighter were also provided to the Japanese Embassy in Berlin in early 1945, of which a portion was transmitted to Tokyo by radio.

Henschel

Design drawings of the Hs 129 ground-attack



ABOVE The original plan had been for Japan to manufacture both the Messerschmitt Me 262 and Me 163B and their powerplants under licence — but, when the bulk of blueprints and technical details sent by submarine from Germany were lost at sea, the Japanese were forced to come up with their own design, the Mitsubishi J8M/Ki-200.

aircraft and a complete pressurised cabin and drawings for the Hs 130C high-altitude aircraft, along with full details of the Hs 293A missile (seen **BELOW**), were aboard German submarine U-234 when it was forced to surrender to the Americans while on its way to Japan when the war in Europe ended in May 1945.

Junkers

On November 1, 1944, the RLM ordered the construction of a mockup Do/Ju 635, to be followed by four prototypes and six pre-production Do/Ju 635A-0s, each to be powered by four DB 603s arranged in the twin fuselages, production having been planned for a total of 20 aircraft. In January 1945 the RLM offered immediate licence production to the IJN, which showed much interest in it. On January 18, 1945, all documentation was to be transferred to Japan, but this did not take place. Likewise, negotiations that were ongoing in February and March 1945 to supply full design drawings and data for licensed manufacture of the Ju 287 and Ju 488 heavy bombers came to nothing.

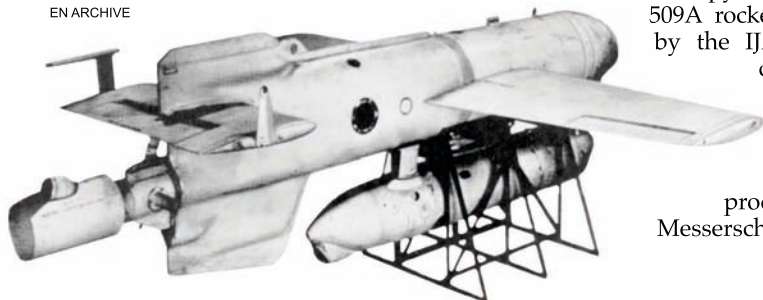
In 1944 Japanese delegations visited the Junkers engine plant at Dessau, where production of the Jumo 004B turbojet was under way, the last such visit taking place on March 5, 1945. Plans had also been made for the Japanese to manufacture the Jumo 213, 222 and 223 piston engines, but they were not in receipt of any before the war's end. In addition it was agreed with the Japanese in September 1944 that Dr Ing Ferdinand Brandner of Junkers would accompany a Jumo 222 piston engine — for which the sum of 10 million Reichsmarks would be paid for the manufacturing rights — aboard a submarine to Japan in early 1945, but he never undertook the journey. In terms of assistance with Jumo 004B turbojet production, Junkers was prepared to send only one individual to Japan.

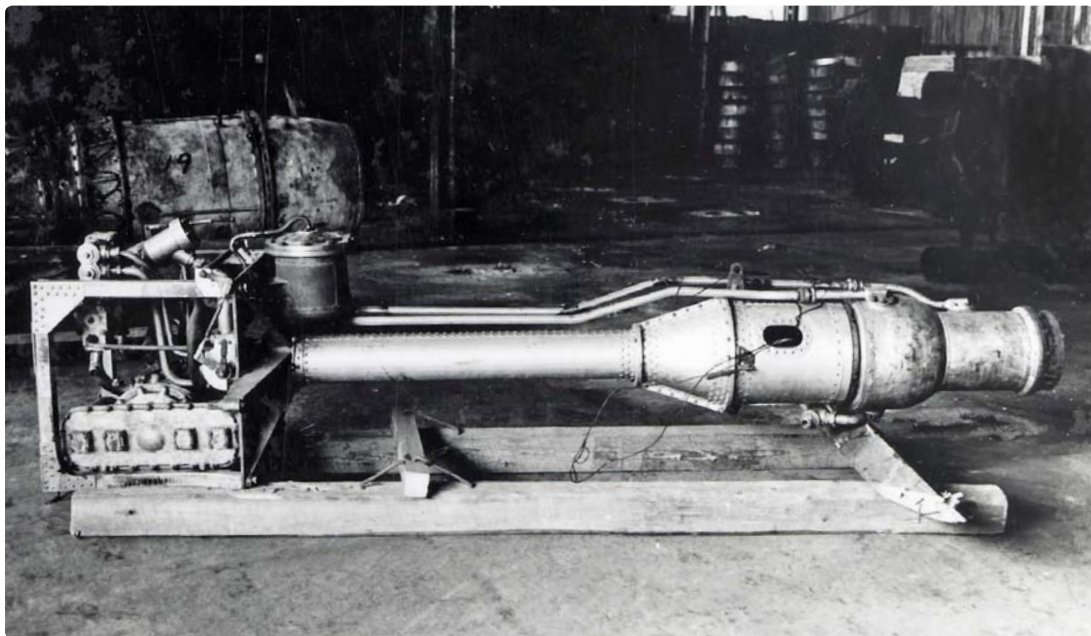
Messerschmitt

Visits by Japanese specialists were made to Messerschmitt production centres in Germany to inspect examples of the Me 163B and Me 262A in the summer of 1944. Production of the Mitsubishi Ki-200/J8M1 Shusui (Rigorous Sword), an Me 163B copy, and a derivative of its Walter HWK 509A rocket engine (built as the Toku-Ro 2 by the IJAAF and KR-10 by the IJNAF), commenced shortly thereafter.

A little-known fact is that the Japanese initially fully intended to put both the Me 163B and the Me 262 into licensed production, hence their agreement to Messerschmitt retaining complete originator

EN ARCHIVE





ABOVE The Japanese Toku-Ro 2 bipropellant rocket engine, based on the German HWK 509A, was capable of some 3,300lb (1,500kg)-thrust, but was too late to have an impact on Japan's war effort. **BELOW** The MXY8 was a training glider version of the rocket-powered J8M. The prototype J8M1 crashed on its first flight on July 7, 1945.

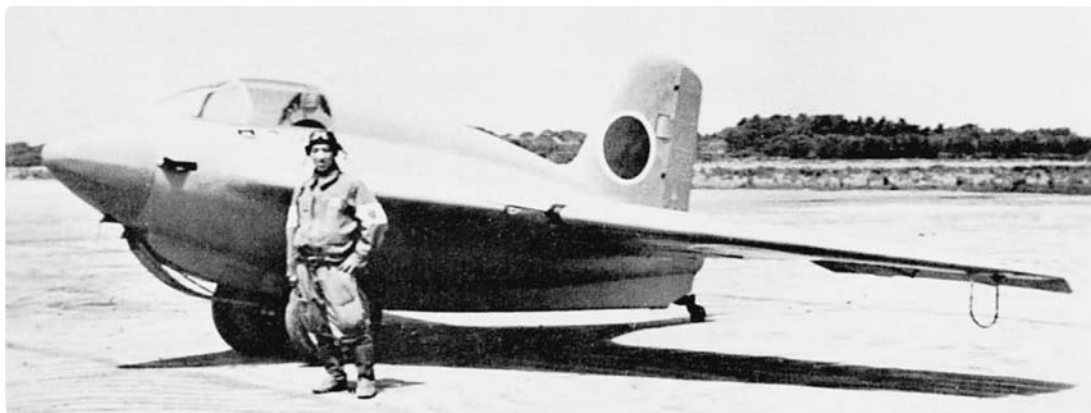
and inventor copyrights for the design. Material quantities calculated by Messerschmitt were based on a production run of 600 aircraft.

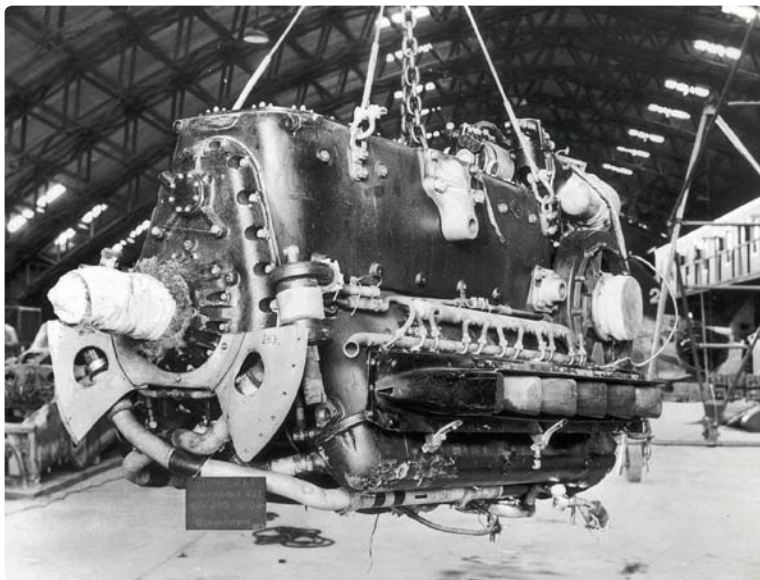
Negotiations were concluded with Japan agreeing to pay 20 million Reichsmarks for the manufacturing rights for the BMW 003A turbojet and the same amount for the Walter HWK 509A rocket engine and Me 163B. Germany was to supply the necessary drawings, specifications and samples of the propulsion units and aircraft, which were to be placed aboard at least two submarines. Documentation to enable licence manufacture of the Me 163B-0/R2 was handed over on August 2, 1944, and for the Me 262A-1 nine days later, both to IJN Lt-Cdr Nagamori. At the request of the Japanese, a number of Messerschmitt production specialists were to be sent to Japan on four

U-boats, including U-864 and U-234; but, except for two specialists on the latter, the others were lost when the U-boats were sunk by the Allies.

TRANSPORT SETBACKS

During the course of the Second World War Japan came into the possession of six German submarines. According to one account, Hitler, without informing the OKM, had decided in January 1943 to present the Japanese Naval High Command with two submarines. One of these, Type IXC U-511, given the German codename *Marco Polo I* (later named *Satsuki No 1* and redesignated RO-500 in Japanese service), left the German-occupied Atlantic submarine base at Lorient in Brittany with its German crew and cargo of scientists and engineers, on May 10,





LEFT Based on the DB 601 that powered a number of Germany's wartime aircraft, the 1,100 h.p. Kawasaki Ha-40 12-cylinder liquid-cooled supercharged direct-fuel-injection engine was used to power the IJAAF's Ki-61 Tony fighter. Liquid-cooled engines were not favoured in Japan, the vast majority of its fighting aircraft being fitted with more rugged radial engines.

BELOW Also based on a German design — the BMW 003A — the Ishikawajima Ne-20 was Japan's first turbojet powerplant, and was intended to power the twin-engined Nakajima Kikka and later variants of the Yokosuka MXY7 Ohka (Cherry Blossom) suicide aircraft.

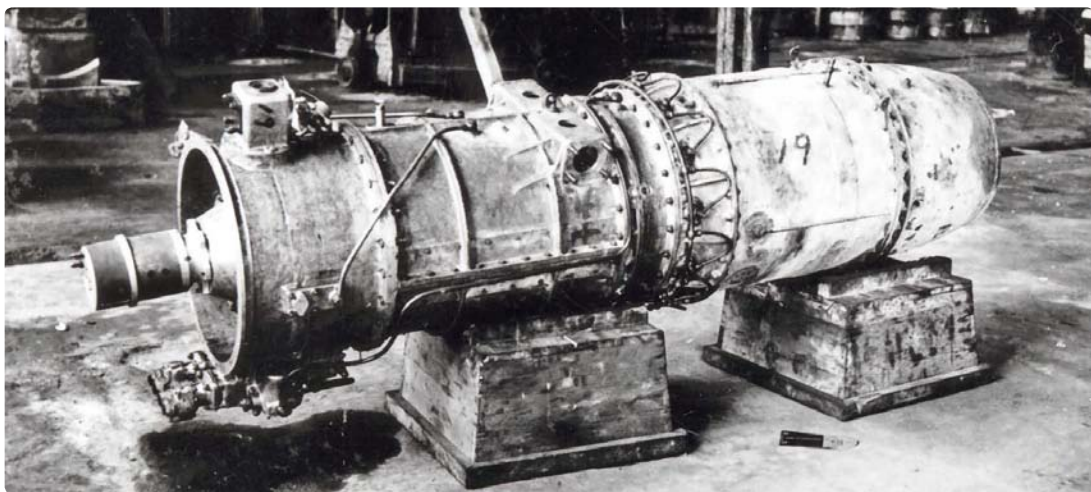
1943, eventually arriving safely at Kure, Japan, on August 7, 1943. The other U-boat, U-1224, codenamed *Marco Polo II* (by this time sailing under the Japanese pennant as RO-501 / *Satsuki No 2*), left Kiel on April 30, 1944, under the command of IJN Lt-Cdr Sadatoshi Narita and his crew, carrying precious metals, uncut optical glass and Type IX submarine and Me 163B blueprints.

Back in December 1943 Japanese submarine I-29, codenamed *Matsu* (Pine) and carrying a cargo of rubber, tungsten, quinine and opium, left Singapore for Lorient, where it arrived on March 11, 1944. On April 16 I-29 set off for the return to Japan with technical drawings and samples of the BMW 003A, Jumo 004B and HWK 509A engines, blueprints for the Me 163B and Me 262, 20 *Enigma* code machines, documentation and drawings for the Italian Isotta-Fraschini torpedo-boat engine and its Campini-designed jet propulsion unit (see

Secondo's Slow Burner in TAH6), acoustic mines and quantities of bauxite and mercury.

Submarine I-29 left for Japan with its important cargo under the charge of IJN Commander Kikkawa on April 16, 1944. However, while I-29 and RO-501 were en route in the Atlantic, the latter was discovered by the American destroyer escort USS *Francis M. Robinson* (DE-220), part of the escort carrier CVE-9 *Bogue* hunter-killer group, and was sunk 400 miles (640km) south of the Azores between Recife, Brazil, and Dakar, Senegal, on May 13, 1944, with the loss of all its crew and — significantly — invaluable cargo.

More successful was I-29's 87-day journey to Singapore, where it arrived on July 14, 1944, with IJN Technical Commander Eichi Iwaya and his colleague Capt Haruo Yoshikawa in charge of the technical material. With as much material as he could carry, including handbooks, layout copies



Although broadly similar in configuration, the Nakajima Kikka had none of the aerodynamic finesse of its inspiration, the larger Messerschmitt Me 262. Completed in August 1945, the prototype made its maiden flight on August 7; one more flight was attempted (but aborted on take-off) before Japan's surrender on August 15.



and technical data on the BMW 003, HWK 509 and Me 163B, Iwaya flew on to Tokyo on July 17, leaving the remainder of the material aboard the submarine, which was expected to arrive in Japan in due course after taking on replenishments.

Under Commander Takakazu Kinashi, one of the aces of the Imperial Japanese submarine fleet, *I-29* left Singapore for Kure on July 22. Four days later, however, the submarine was discovered and sunk by American submarine *USS Sawfish* (SS-276) south of Formosa and west of Manila, unknowingly betrayed through an *Ultra* intercept of a radioed message. Three crew members were thrown overboard, one of whom managed to swim to a small island in the Philippines to relate what had happened; Kinashi went down with his submarine, its crew and all of its remaining cargo.

Japan was therefore left with only the incomplete material Iwaya had saved, which clearly indicated that German development of the BMW 003 and Jumo 004 turbojets was far in advance of its own efforts, as were Germany's developments of liquid-propellant rockets using *T-Stoff* (hydrogen peroxide) and *C-Stoff* (hydrazine hydrate, methanol and water), on which the Japanese had yet to start work. As a result, an extensive programme was initiated by the IJA and IJN to develop reliable axial-flow turbojets for aircraft, and liquid-propellant manufacture and production for rocket interceptors and missiles. Owing to the shortage of normal aviation fuel, trials of pine-root oil for turbojets and pulsejets were undertaken, the latter two programmes having been accorded the highest priority in the last year of the war. *[More on this subject in a future issue — Ed.]*

From late 1943 onwards, and particularly from April 1944 until the end of the war in Europe in May 1945, the secrets of German jet- and rocket-

powered aircraft, powerplants, air-launched missiles, radar equipment, torpedoes, hydrogen-peroxide-driven Walter U-boats and samples of uranium oxide had been passed to the Japanese Military Missions in Berlin. Japanese interest had centred on acquiring as much information as possible, not only about the aircraft and powerplants mentioned previously, but also on the Arado Ar 234B, He 162A, Fieseler Fi 103 (V1 flying-bomb) and its Argus As 014 pulsejet, HWA A4 (V2) rocket and rocket engine fuels. A portion of all this is known from Allied intercepts of transmissions from the Japanese Embassy in Berlin by radio to Tokyo in late 1944 and early 1945, which in some cases gave the Allies unexpected data on the latest German jet aircraft.

THE FINAL DIVIDEND:

Although certain technical aspects of the BMW 003A turbojet engine — the axial compressor and annular combustion chamber, for example — were ultimately incorporated into the design of the Ne-20 turbojet that powered the Nakajima Kikka (*Chrysanthemum*) twin-jet fighter, broadly based on the layout of the Me 262, no examples of the powerplant (or the similar Jumo 004B) were built by the Japanese. Instead the latter were concentrating on the development of their own more powerful turbojets in the shape of the Ne-130, Ne-230, and Ne-330.

While some small-scale liquid-propellant rocket engines were built and tested by the Japanese in order to gain experience with *T-Stoff* and *C-Stoff* before construction of the HWK 509A for the *J8M1 Shusui*, only the first prototype aircraft flew; and, of the seven completed of 12 unfinished airframes found by the Allies at war's end, three were shipped to the USA, together with a Kikka airframe and its turbojets.



I ACCELERATED TO
MACH 1.9 TO CATCH
THE INTRUDER AND
FIRED TWO MISSILES;
THE FIRST, AN R-24T
FROM THE PORT WING
STATION, SCORED
A HIT...



...BLAAAAM!

Six dramatic minutes over Angola

AUGUST 1988: A BOTSWANAN DEFENCE FORCE BRITISH AEROSPACE 125 CARRYING THE PRESIDENT TO A VITAL MEETING IN THE ANGOLAN CAPITAL STRAYS UNWITTINGLY INTO HOSTILE AIRSPACE; WITHIN MINUTES A CUBAN-MANNED MIG-23 HAS BEEN SCRAMBLED AND HAS THE TARGET "LOCKED ON". TOM COOPER PUTS US IN THE PILOT'S SEATS OF BOTH AIRCRAFT . . .

THERE HAVE BEEN many instances of commercial airliners being intercepted by combat aircraft. Most of the time such incidents are caused by accident rather than by design and end peacefully. However, sometimes things go wrong — and when they do, they usually end with catastrophic results. Incidents such as the shooting-down of a Korean Airlines Boeing 747 by a Soviet Sukhoi Su-15 near Sakhalin in September 1983, the loss of an IranAir Airbus A300 from a missile launched from the US Navy cruiser *USS Vincennes* (CG-49) in June 1988, or, more recently, the Malaysian Airlines Boeing 777 shot down by SA-17 surface-to-air missiles (SAMs) operated by pro-Russian separatists in the Ukraine in July 2014, have provoked well-known international scandals.

Many other cases remain less well-known. Here we take a look at a little-known accident that occurred over a “forgotten” corner of the world at a time when attention was very much focused elsewhere. The incident ultimately ended well too, largely thanks to the outstanding airmanship of a British pilot.

THE ANGOLAN WAR

In 1988 the civil war that had blighted Angola since 1975, and which had seen the involvement of several major international powers, appeared to be nearing its end. Following negotiations supervised by the United Nations (UN), the governments of the Soviet Union, Cuba and

South Africa reached an agreement for a phased withdrawal of all foreign troops from the country, and this was soon in full swing. However, the insurgency led by the *União Nacional para a Independência Total de Angola* (National Union for the Total Independence of Angola — UNITA) against the government in the Angolan capital, Luanda, continued, with the rebels still receiving clandestine support from South Africa and the USA.

The Angolan government continued to acquire arms from Moscow, despite the latter's efforts to establish commercial relations with South Africa. Indeed, in August 1988, one of two *Força Aérea Popular de Angola/Defesa Aérea e Antiaérea* (Angolan People's Air Force / Air Defence Force — FAPA/DAA) units equipped with Mikoyan-Gurevich MiG-23ML *Flogger-G* interceptors was still manned by Cubans, who flew not only combat air patrols (CAPs), but also ground-attack sorties against UNITA forces. Furthermore, owing to flights made by unidentified transport aircraft which often violated Angolan airspace to bring in supplies for the insurgents, the FAPA/DAA's ground-based air defences were still on high alert.

It was under these tense circumstances that the President of Botswana planned to visit Luanda, as recalled by the British pilot who was to fly him there, Arthur Ricketts:

“I had been employed on the test and demonstration programme for the British Aerospace 125 series of aircraft for the previous

OPPOSITE PAGE On August 7, 1988, Angolan Mikoyan-Gurevich MiG-23ML *Flogger-G* C479, flown by Cuban pilot Capt Albert Olivares Horta, fired a pair of air-to-air missiles at Botswana Defence Force BAe 125 serial OK1 after an Angolan air traffic control oversight put the latter in proscribed airspace. Illustration by IAN BOTT © 2016.



ABOVE Continuing the line that began in the early 1960s with the de Havilland D.H.125 Jet Dragon, the British Aerospace 125-800 made its maiden flight on May 26, 1983, incorporating state-of-the-art avionics and a pair of Garrett turboprops. The Botswana Defence Force acquired OK1 in 1988, when it joined Z1 Transport Squadron.

eight years. One of these [125-800B c/n 258112, coded OK1] was operated by the Botswana Defence Air Force Air Wing, and I was tasked to fly His Excellency Quett Masire, President of Botswana (**INSET RIGHT**), and eight other government officials from the capital of Botswana, Gaborone, to Luanda. The aircraft was crewed by Col Albert Scheffers, CO of the Air Wing, and me, employed as a transport and training captain with British Aerospace. Scheffers had completed his type conversion in the UK and I was continuing his line training in Botswana."

INTO THE COMBAT ZONE

On August 7, 1988, the 125 entered Angolan airspace while flying at 35,000ft (10,700m) along a commercial corridor which connected Mavinga in Angola's Cuando Cubango province and the capital. The flight was announced to Luanda air traffic control (ATC), which had also received a note from the FAPA/DAA about the closing of this commercial corridor to all traffic, owing to combat operations in the Kuito Bié province.

Teniente Coronel Eduardo Gonzalez, Operations Commander of the Cuban MiG-23 squadron assigned to the FAPA/DAA (the unit in question had no official designation) based at Menonque



AB in Cuando Cubango, was serving his second combat tour in Angola:

"It was during Operation *Second Congress* in 1985 that we asked ATC in Luanda to close this corridor to all commercial traffic because it overflew a combat zone. We repeated such requests on a number of occasions, and documents on the matter were signed, but to no avail. Airlines continued to fly over what everybody in the area should have known was a war zone. Even today I do not understand how any responsible airline could ever accept a flightplan that overflies a combat zone."

Concerned about the likelihood of causing a major embarrassment and diplomatic incident, Gonzalez ordered his pilots to take precautions before opening fire:

"As the world's 'black sheep', we [Cubans] could not afford a similar mistake to those experienced by the Soviets and Americans before. I instructed my pilots that before launching their missiles at any such target in daylight, they must visually identify it. Despite all the calls to ATC in Luanda, twice a month in broad daylight I intercepted a DC-10 from Mozambique under way somewhere over Mavinga heading in the direction of Luanda."

“As the world’s ‘black sheep’, we Cubans could not afford a similar mistake to those experienced by the Soviets and Americans ... I instructed my pilots that before launching their missiles at any target in daylight, they must visually identify it ...”



VIA MARK LEPKO

ABOVE *In one of the more unusual Cold War anomalies, it is thought that up to three MiG-23 units of the FAPA/DAA (Força Aérea Nacional de Angola since the mid-2000s) were staffed entirely by Cuban personnel during 1985–89. Two-seat MiG-23UB trainers, including 121 seen here, were shared between the Cubans and Angolans.*

By night, the situation was entirely different. The Angolan authorities were eager to intercept regular intruders which had been delivering supplies to UNITA for years. However, because of the size of the country and its relatively poor radar coverage, this proved difficult. Indeed, Gonzalez was the only pilot, Angolan or Cuban, ever to have managed to intercept a South African Air Force Lockheed C-130 Hercules over Angola, which he did on April 4, 1986:

“My radar picked up two South African C-130s, and I fired two R-24 [Nato reporting name *Apex*] missiles at one of them. Neither scored a hit. One passed at supersonic speed so close to the port wing of one of the transports that the crew felt the thud from the shockwave.”

THE INEVITABLE INCIDENT

The FAPA/DAA continued scrambling its *Flogger-Gs* for further interceptions, including at night, even though it was clear that the pilots would have next to no ability to identify intruders visually before having to open fire — or run out of fuel. As the violations of Angolan airspace continued on an almost daily basis, the situation was set to lead to an inevitable incident, much to Gonzalez’s concern:

“I was terrified that if a passenger aircraft entered the zone by night, we would not be able to establish a visual ID. I was sure an incident

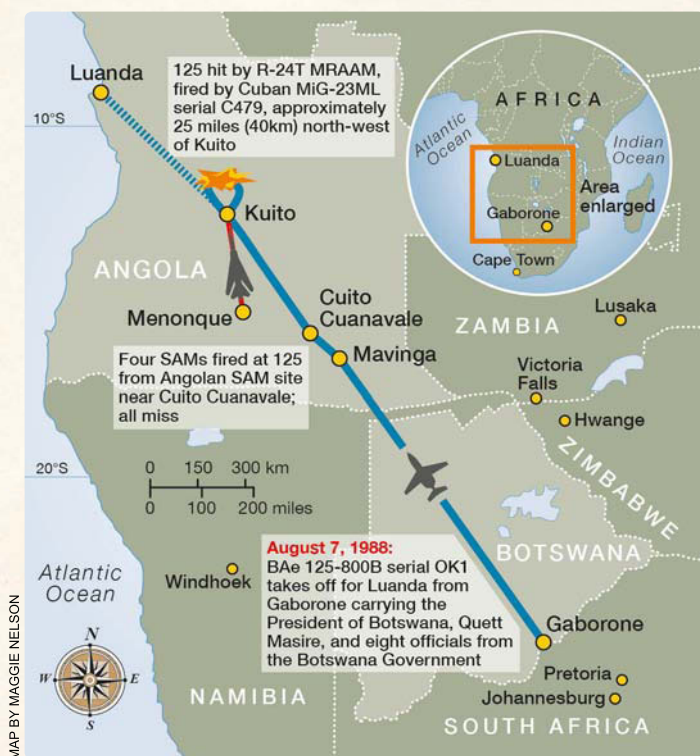
involving a civilian airliner was going to happen sooner or later.”

By early August 1988 the stage was set for just such an incident. After Luanda ATC failed to warn the Botswanans about sending OK1 over the combat zone, and furthermore failed to warn the FAPA/DAA that a VIP transport was about to pass overhead, Gonzalez’s fears turned into reality, as he explains:

“The aircraft in question first came under fire from an Angolan SAM site near Cuito Cuanavale. The site was on full readiness and attempted to identify the ‘bogey’. There was no friendly IFF [identification friend or foe] response and a ‘clear to fire’ order was issued. Four missiles were fired but all missed; they were out of sync with the fire-control radar.”

The small business jet was still not outside the danger zone. Headquarters FAPA/DAA then scrambled MiG-23ML serial C479, flown by a Cuban pilot, Capt Albert Olivares Horta, from Menonque. Horta recalls:

“I accelerated to Mach 1.9 to catch the intruder but never established a visual ID before opening fire. I fired two missiles; the first was an R-24T from port wing station No 3, launched from a range of 20km [12½ miles]. This scored a hit, and that was when I sighted my target for the first time. Then I fired an R-24R from starboard wing station No 4. Luckily for the crew and



ABOVE British Aerospace 125-800 demonstration and display pilot Arthur Ricketts had a wealth of experience of flying in Africa, having previously flown Vickers VC10s for East African Airways. When the pilot of OK1, Albert Scheffers, one of Botswana's pioneer pilots, was incapacitated, it fell to copilot Ricketts to act quickly and decisively.

passengers, this missile went astray. With the first missile scoring a hit and the MiG running out of fuel, I then disengaged."

COOL, CALM AND COLLECTED

The impact of the first missile blew the 125's starboard engine clean off. Arthur Ricketts recalls the drama that then unfolded aboard the badly damaged business jet:

"At the point of impact Col Scheffers was rendered incapacitated by the instantaneous application of approximately 33g [calculated by BAe stress engineers later, based on damage to the fuselage frames], which threw him hard against the port cockpit wall, and he played no further part in the recovery of the aircraft. Also at this time the engineer travelling with us was thrown into the cockpit from the cabin. The aircraft sustained damage to the pressure cabin which resulted in explosive decompression.

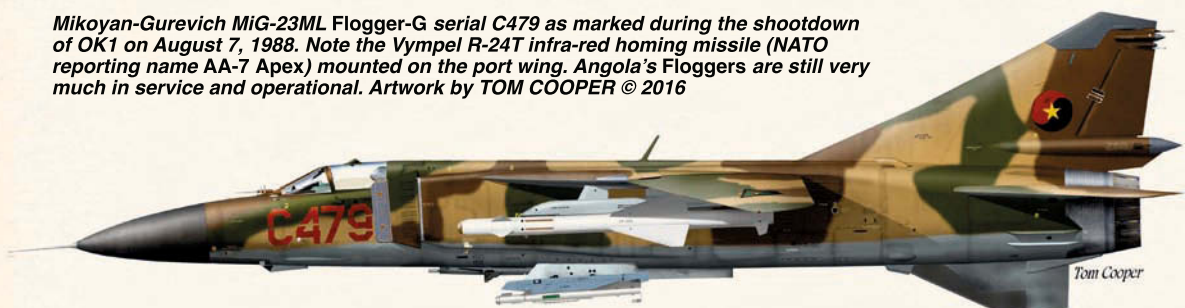
"At least one window was shattered by

shrapnel from the engine, approximately a ton and a half of fuel was lost from the damaged starboard wing tanks, all radio navigation systems failed and the cabin oxygen masks failed to deploy automatically.

"My first instinct was to regain control of the aircraft by rolling it away from the vertical and establishing a stable descent, which I achieved by the time we reached FL 280 [28,000ft/8,500m]. Initially we were descending at about 6,000ft/min [1,800m/min], which gave me about six minutes to sort everything out before arriving very hard in Africa. In that six minutes I managed to transmit two *Mayday* calls; one to Luanda, which was apparently not received or understood, and the other on HF [high-frequency] radio which was picked up and acted on by Santa Maria in the Azores.

"I had substantial previous experience of flying in Africa and assessed that there was probably an airstrip of sorts at Kuito, some 25 miles

Mikoyan-Gurevich MiG-23ML Flogger-G serial C479 as marked during the shootdown of OK1 on August 7, 1988. Note the Vypel R-24T infra-red homing missile (NATO reporting name AA-7 Apex) mounted on the port wing. Angola's Floggers are still very much in service and operational. Artwork by TOM COOPER © 2016





ABOVE With just the skeletal remains of the starboard engine mounting still attached, OK1 is the subject of much discussion at Kuito in the aftermath of the incident. Although the aircraft looks relatively unscathed, it was heavily damaged.

ARTHUR RICKETTS x 2

[40km] behind the point at which we were hit. During the descent I had assessed the aircraft systems remaining and had made the decision to leave extending the flaps and undercarriage until shortly before landing, not expecting them to work. However, when the engine departed the airframe, the quick-release couplings on the hydraulic pump, starter/generator and alternator did their job and I had the use of flaps, undercarriage and brakes — certainly necessary as the damage demanded a landing speed of some 150–160kt.”

Considering the severity of the damage to the aircraft, it was a miracle that OK1 remained intact, enabling Ricketts to land at Kuito safely. Subsequent investigation of the aircraft revealed that the entire cabin of the aircraft was knocked out of its fasteners and inclined at an angle of 15° to the fuselage. A number of passengers suffered serious injuries, as Ricketts recalls:

“Injured passengers were attended to at the hospital in Kuito, before we were eventually uplifted to Luanda. President Masire was injured by a fan blade that penetrated the cabin and hit the back of his seat. He was subsequently flown to England by the RAF for treatment.”

Arthur Ricketts was awarded the Diploma of Outstanding Airmanship in 1989 by the *Fédération Aéronautique Internationale* — an honour awarded only once a year, and richly deserved in this case. Arthur still holds a valid Air Transport Pilot’s Licence (ATPL) well into his seventies.



ABOVE The starter/generator and alternator hang at the end of wiring looms and cables at Kuito. Although the airframe sustained severe damage, the sturdy bizjet was rebuilt by BAe and sold to a new owner in Brazil as PT-OBT. It survives today and is regularly operated by a company in Georgia, USA, as N812GJ.

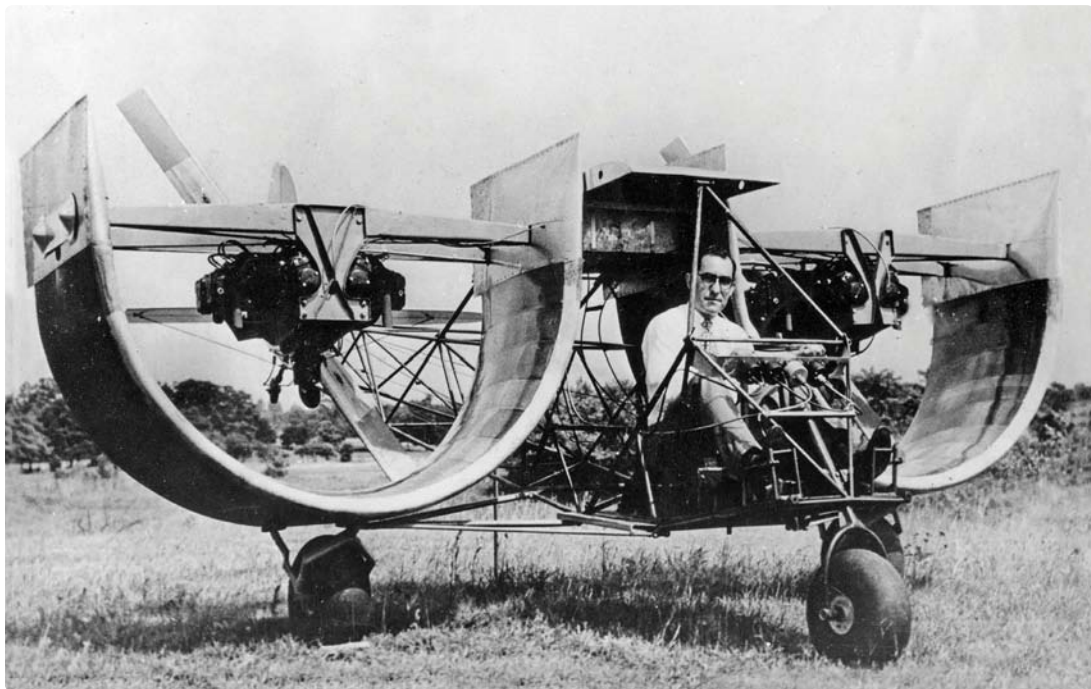
TOM COOPER is the co-author, along with Peter Weinert, Fabian Hinz and Mark Lepko, of the indispensable *African MiGs* series published by Harpia Publishing, which details the little-known activities of MiGs and Sukhois of the various air forces of Sub-Saharan Africa. Volume 1 (ISBN 978-0-982553-95-4) covers Angola to Ivory Coast; Volume 2 (ISBN 978-0-982553-98-5) looks at Madagascar to Zimbabwe. For full details of Harpia’s extensive book catalogue visit the website at www.harpiapublishing.com.



“ It is the speed of the air and not the speed of the object that counts. The standard aerofoil was designed to obtain a reaction from the **air mass through which it is moved**. My aerofoil was designed to obtain a reaction from the **air mass moved through it** . . . ”

willard custer & 
the **channel wing**





Watching a violent storm tear off the roof of the barn in which he was sheltering, self-taught inventor Willard Custer had a “lightbulb moment” — what if air could be pulled over a wing rather than the wing being pushed through the air? **NICK STROUD** explores Custer’s battle to bring his oft-dismissed — yet scientifically proven — channel-wing concept to the world

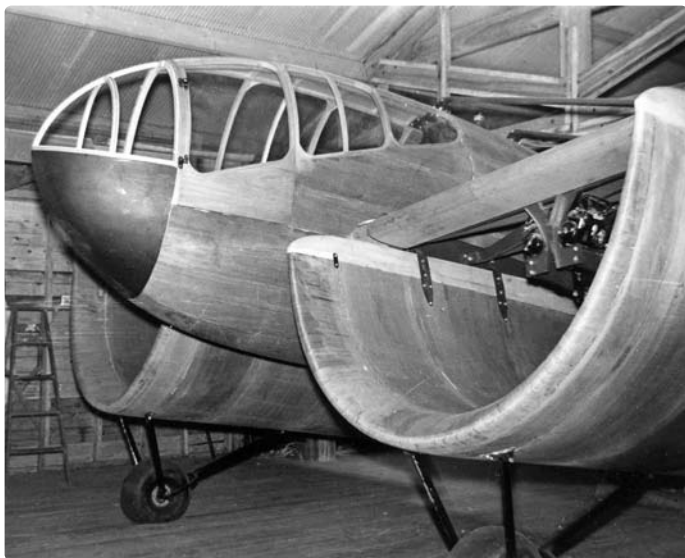
THE WORLD OF aviation has long been a natural home for the wildly imaginative and fiercely ambitious, its history peppered with numerous unusual and often freakish concepts fostered by a disparate collection of oddballs, geniuses, crackpots and visionaries. Separating the crank from the prophet has sometimes been easy, and sometimes ideas that appeared outlandish and fanciful at the time of their inception have gone on to become cornerstones of aeronautical progress. When Frank Whittle submitted his jet engine design to the British Air Ministry in 1930, Alan Griffith at the Royal Aircraft Establishment dismissed it as “impracticable”, and “useless for aircraft applications”.

One such “weird-and-wonderful” idea which has struggled to gain traction in the aeronautical mainstream since its pre-war development, despite conclusive proof that it works and could deliver on its promises to a considerable extent, is American inventor and engineer Willard Custer’s ingenious “channel wing” concept, in which air

is sucked through a half-tube channel with an aerofoil section by means of a pusher-configured propeller mounted at the rear of the channel. Instead of the wing having to be propelled through the air for the resulting aerodynamic forces to become sufficiently effective to generate lift, as per the conventional model, a mass of air is forced into the channel and over its aerofoil section at speed, thus generating an upward lift component while the aircraft is standing still. Using what he called “aerophysics”, rather than the usual aerodynamic principles, Custer devised a system in which the powerplant provided both lift and thrust, as opposed to a conventional system in which the wings provided only lift and the powerplant only thrust.

The concept was not without its drawbacks, however, and although the channel-wing principle was proven by several successful designs, the idea never found favour with manufacturers and remained a theoretically interesting but largely forgotten novelty. Until the mid-1990s, that is, when a pair of engineers,

OPPOSITE PAGE *The doggedly determined Willard Ray Custer beside the final iteration of the sole production Custer Channel Wing CCW-5 in the mid-1960s. TOP* President of Custer’s first company, the National Aircraft Corp, Frank D. Kelley sits at the controls of the startling CCW-2, Custer’s second full-size channel-wing aircraft, in 1948.



LEFT Custer's first full-size aircraft, the CCW-1 is seen here under construction in the inventor's laboratory/workshop/office in Hagerstown, Maryland, in 1942. Never one to make life easy for himself, master woodworker Custer created a sophisticated, streamlined ovoid fuselage from spruce and mahogany plywood.

CUSTER CCW-1 DATA

Span	32ft 10½in (10m)
Length	19ft 11in (6.07m)
Channel diameter	6ft 0in (1.8m)
Wing chord	7ft 0in (2.1m)
Wing area	202.5ft² (18.8m²)
Dihedral	10°
Tailplane span	7ft 0in (2.1m)
Tailplane chord	4ft 3in (1.3m)
Undercarriage track	9ft 6in (2.9m)

one from NASA and the other from the Georgia Institute of Technology Research (Georgia Tech), decided that the idea was worthy of further investigation, especially as technology had moved on and options unavailable to Custer in his original experiments could potentially solve most, if not all, of the concept's shortcomings.

THE VISIONARY

The great-grandnephew of the famous General George Custer, who made the legendary Last Stand at Little Big Horn in 1876, Willard Ray Custer was born on June 6, 1899, at Warfordsburg, Pennsylvania, the son of a blacksmith. Leaving school at 13 to work in the family business, Custer was fascinated by flying and the experiments of the Wright brothers and others, becoming an avid reader of "every aviation book I could get my hands on", as he later explained.

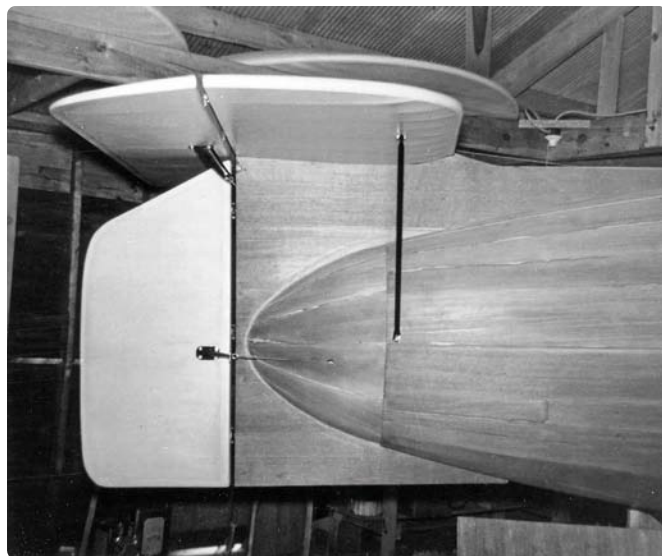
No American success story — or otherwise — is complete without a legend to support it, and Custer's begins with his need to find shelter during a particularly violent summer storm in 1925. Taking refuge in a barn, the 26-year-old Willard was terrified and fascinated in equal measure when the wind tore the roof off. "The barn wasn't flying," he later recalled, "it wasn't even moving. What made that roof move through the air?" Knowing that an aircraft had to accelerate down a runway to bring the aerodynamic forces into play to generate lift before it could take off, Custer was puzzled as to why the prevailing conditions had managed to lift the heavy barn roof, which had no aerofoil characteristics whatsoever and was attached to an object firmly planted in the ground.

After much thought, Custer concluded that the high velocity of the wind had created a region of low-pressure air above the roof while the pressure remained high inside, thus to some degree repli-

cating the conditions that apply to a wing. A wing generates lift when faster air flowing over the top of its cambered surface creates a region of air with lower pressure than that flowing beneath the wing, as per Bernoulli's Principle. Rather than think in terms of aerodynamics, Custer developed his theory of "aerophysics", the subtle difference being that the former deals with the reaction of a body while in motion, while the latter is concerned simply with the interaction between any given surface and the air. As he later explained in his published work *Theory of Channel Wing Aircraft: Speed of Air*, "the [aircraft] industry has been handcuffed to the word 'airspeed' since the beginning of flight because airspeed was always a requirement before lift could be thought of. Perhaps the term 'lift' needs a new definition for the directional lifting force induced aerophysically when dynamic airflows are passed through a channel wing".

Placing a pusher-configured propeller at the aft end of the channel would suck air into the channel over the aerofoil surface at speed, thus significantly reducing the pressure in the channel and generating lift without the aircraft having to move at all. If Custer was right, a new type of wing/powerplant combination based on his concept would sustain flight at low speeds, yet retain the desirable features of low drag and boundary-layer control for high-speed flight. In theory, it was capable of vertical flight, although this was not its primary objective — a point which would later prove somewhat controversial.

Encouraged, Custer set about proving his ideas in 1928 by bolting an aircraft engine to the floor of his workshop and erecting a primitive three-sided channel with square corners ahead of it. Custer started the engine and the propeller began sucking air through the channel, exactly as predicted, although the experiment proved the



HOWARD LEVY



theory a little too effectively. Custer later recalled:

"I didn't know what power I was dealing with. I was dealing with atmospheric pressure; that's 14.7lb/in² at sea level, and 14.7lb/in² is more than a ton of pressure per square foot. When that prop started sucking air through the channel, it created a vacuum. Nature abhors a vacuum and wants to fill it up. All that pressure on the outside of the channel crushed it.

"The windows broke and the walls sagged. If I hadn't had the door open the whole shop would have come down. The solution was to build the channel strong enough so it wouldn't crush. So, with the vacuum inside it, it would rise like a cork in water."

Having established that his concept worked, Custer obtained his first patent for a channel-wing aircraft in 1929, although family commitments and his then job as a successful car salesman prevented him from experimenting with full-scale aircraft over the next decade. Convinced that he could make a commercial success of his unusual but scientifically sound idea, Custer took a leap into the unknown in 1937, when he left his job to concentrate on developing the channel wing.

TURNING IT INTO A BUSINESS

With capital raised from family, friends and other investors impressed by Custer's drive and ambition, the determined 40-year-old established the National Aircraft Corporation (NAC) in Hagerstown, Maryland, in 1939, having built a scale model of a channel-wing aircraft powered by a pair of tractor-configured 0.25 h.p. Herkimer petrol engines to show to potential investors. On its establishment, the NAC board comprised eight members, including Custer's two sons, Harold and Reed, and pilot and photographer Frank Kelley as President. The other members were a mixture of local grocers, bakers, lawyers

ABOVE LEFT The CCW-1's original empennage, with vestigial tailfins plus rudder, and low-aspect-ratio tailplane with a single-piece elevator. This arrangement was later replaced with a boxkite-type tail during military trials at Beltsville in 1943, although the original was reinstated after the trials. **ABOVE RIGHT** The cover of the May 1947 issue of Popular Mechanics, featuring the CCW-1 and "the wing that fooled the experts".

and other non-aviation types keen to make a buck from Custer's new idea.

With the support of a fully capitalised company behind him, Custer set to work on his first full-size channel-wing aircraft, the CCW-1, a streamlined twin-engined design of striking art deco appearance. A master craftsman, Custer built the airframe himself, the channels in particular drawing praise as beautiful examples of the woodworker's art.

The CCW-1's fuselage, an elongated ovoid of conventional spruce and mahogany plywood monocoque construction, was 19ft 11in (6.07m) long with a vestigial tail, at the end of which was a rudder, with a low-aspect-ratio tailplane with elevators mounted atop the aft end of the fuselage. The outer wings comprised semi-circular detachable tips attached to constant-chord wing surfaces, with the leading-edge D-box alone continuing to the fuselage, leaving the channel sections mostly open-topped. The latter were 6ft (1.8m) wide and hung between the outer wings and the fuselage. A 75 h.p. four-cylinder air-cooled Lycoming engine was mounted approximately midway through each channel, the starboard propeller rotating clockwise and the port propeller anti-clockwise. The primitive non-retractable taildragger undercarriage consisted of a pair of mainwheels attached to the bottom of the channels, and a tailwheel.

By the autumn of 1942 test pilot E. Kenneth Jaquieth had begun taxiing tests with the CCW-1,



HOWARD LEVY

ABOVE A poor-quality but rare photograph of the CCW-1 during its military trials at Beltsville in 1943. Note the 10° dihedral at which the wings are set. Registered NX30090, the dark-blue CCW-1 survives today and is stored at the Paul E. Garber Preservation, Restoration & Storage Facility in Maryland, part of the National Air & Space Museum.

although that November it was its creator who was at the controls for its first flight — despite his not being a qualified pilot. On November 12, 1942, a group of NAC's financial backers arrived in Hagerstown to take a look at their investment, and hopefully see it fly. Custer explained that Jaquieth was not around, but that he would be happy to move the prototype to the nearby testing field for photographs. Applying power to move the aircraft up the hill to the field, Custer watched the trees on the horizon slip below his line of sight, realising with a start that he was airborne. Throttling back abruptly, Custer brought the CCW-1 back to earth, albeit with a slightly bent undercarriage. Fittingly, Custer himself had proved conclusively that a full-size channel-wing aircraft was a very real proposition. The CCW-1 was then extensively tested in a restricted trials programme, flying some 300hr.

A BRUISING MILITARY EXPERIENCE

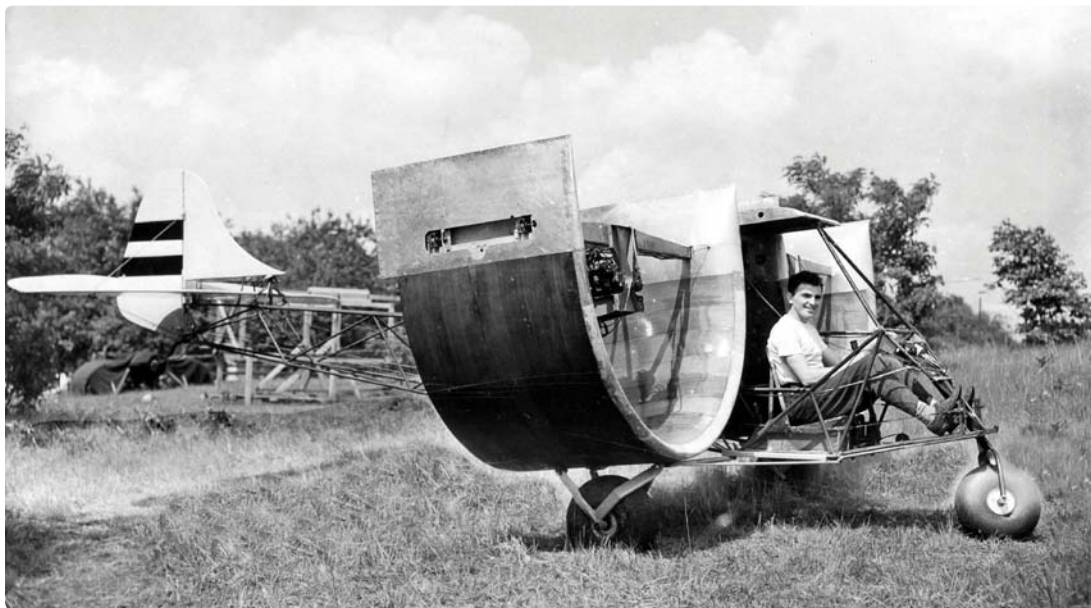
Like all new aeronautical concepts, the channel wing soon attracted the interest of the military, and in 1943 the CCW-1 was sent to Beltsville in Maryland to be assessed by the US Army Air Forces for potential military applications. The results were extremely promising, Brig Gen W.E. Gilmore reportedly telephoning Orville Wright in Washington DC to tell him that he should come and see this remarkable development for himself.

Wright may have declined, but the net result of the trial at Beltsville was that the channel-wing concept was selected for a full government test programme, USAAF Technical Report No 5142 detailing the testing of a 1/3rd-scale powered

model of a Custer channel wing in the 5ft windtunnel at Wright Field, Ohio, in September 1944. Disappointingly for Custer, the report was something of a fudge, stating that the lift generated by the channel wing was similar to the increment of lift generated by normal slipstream velocity in a conventional wing arrangement. However, it also stated that the channel wing could be said to generate substantially more lift than a standard wing, having created more static lift than the weight of the test vehicle — thereby proving that vertical take-off with a channel wing was more than just theoretically possible.

Unfortunately this latter seminal point was omitted from the Report's conclusions, which did, however, include the damning statement that the channel wing was inferior to the helicopter in generating static lift, although it mitigated this by admitting that the channel wing's ability to generate static lift was greater than that of a conventional wing-propeller combination.

The final nail in the coffin of a potential military application for Custer's concept was the Report's final conclusion, which stated that "the [channel wing] device does not show sufficient promise of military value to justify further development by the Army Air Forces". The official line seemed to be "we're concentrating on helicopter and high-lift device development and we don't really have time for this at the moment". An infuriated Custer did little to help his cause by insinuating that the results had in fact been *too* good and that he was the victim of a conspiracy, among helicopter manufacturers and advocates, to bury the channel-wing concept.



ABOVE Willard's son Harold Custer at the controls of the CCW-2, built purely as an engineering testbed to conduct experiments with the channel wing. Based on the fuselage of a Taylorcraft lightplane, the CCW-2 is seen here without outer wing panels and with its original tricycle undercarriage, in which form it first flew in July 1948.

Given later research and practical evidence to the contrary, the Report's reluctance to see value in the concept does seem odd, especially in light of later tests conducted at Wright Field during 1945–47, in which it was proved beyond doubt that the channel wing was capable of direct lift, the results of those tests being used to grant Custer additional patents.

Bruised but not beaten by his experience with the military, Custer focused on creating another test vehicle, taking lessons from the Wright Field data, with a view to proving the brasshats wrong.

ONWARDS AND UPWARDS

Built specifically for further experiments with the channel wing, the CCW-2 mated the fuselage and empennage of a standard Taylorcraft lightplane with 6ft channels of shorter chord than those on the CCW-1 replacing the Taylorcraft's standard wings. Adhering to suggestions made in the later military tests of the 1/3rd-scale model at Wright Field, the propellers were placed at the extreme rear ends of the channels, research having shown that the optimum position for lift generation was when the distance between the propeller disc and aft end of the channel was about 0.5in (1.25cm). It was also shown that the best results were attained when the chord of the channel was less than that of the propeller radius, although it appears that this view was later modified.

On July 3, 1948, Willard's son Harold made the first flight of the skeletal CCW-2, only the tail surfaces being covered. Initially fitted with a tricycle undercarriage and no outer wings, the aircraft, registered N1375V, was later converted to

a taildragger configuration, giving the propellers a vector of vertical, as well as horizontal, thrust when tail-down. At the insistence of the Civil Aeronautics Administration (CAA), outer wing panels were fitted to the CCW-2, although lateral control was largely governed by differential use of the throttles, the outer wings having little effect on the aircraft's performance. Extensive testing followed, with Harold Custer accruing more than 100hr of flying time on the machine, including tethered hovering flights in zero-wind conditions, before the CCW-2 was selected for testing by the National Advisory Committee for Aeronautics (NACA) at its Langley Aeronautical Laboratory in Virginia in 1952.

By this time covered and with a makeshift windscreen fitted, the CCW-2 was put through a rigorous windtunnel test programme at Langley. The ensuing NACA report, published on April 7, 1953, explained that the trials were "to investigate the lift characteristics of a channel/propeller combination and the flow phenomena in and about a channel wing" at windtunnel speeds of 25–40 m.p.h. (40–65km/h). Significantly, the report also stated that "emphasis was placed on determining the static lift characteristics at zero airspeed", i.e. the report would be framed in terms of the CCW-2's vertical take-off and landing (VTOL) capabilities, rather than its short take-off and landing (STOL) characteristics, which were really the *raison d'être* of the concept.

Accordingly, the Report's conclusions focused on the aircraft's lack of controllability in hovering flight and the dangers attendant on any kind of power failure, stating the following regarding



NASA LAL 75363

ABOVE The CCW-2, given the civil registration N1375V, mounted on a test stand in the windtunnel at NACA's Langley Aeronautical Laboratory on May 8, 1952. By the time of the trials the diminutive CCW-2 had been modified with a taildragger undercarriage, the fuselage was covered and a small enclosed cockpit had been incorporated.

asymmetric power conditions: "Of considerable significance is the fact that the [channel-wing] configuration would be uncontrollable with more than a small amount of power asymmetry". The former point was largely irrelevant, as the channel wing had never been designed as a VTOL system, but the latter point was of concern and would continue to dog Custer's attempts to persuade manufacturers to adopt his system. The channel wing would continue to fly unpowered, being of aerofoil section, although the struts supporting the engine in the channel would incur a high drag penalty. Rather more significantly, an engine failure on one side would mean loss of all aerophysical lift on that side, creating a powerful rolling moment in spite of any aerodynamic lift being generated by both wings. A landing under such conditions would have to be made quickly and at comparatively high speed.

Custer put a positive spin on this by explaining that "even if you should crack it up, it will not be a major financial disaster. I figure a good manufacturer can stamp out channel wings in wood or metal like hot cakes. Even including engines, a two-placer should cost no more than \$700".

As long as you were still alive, of course.

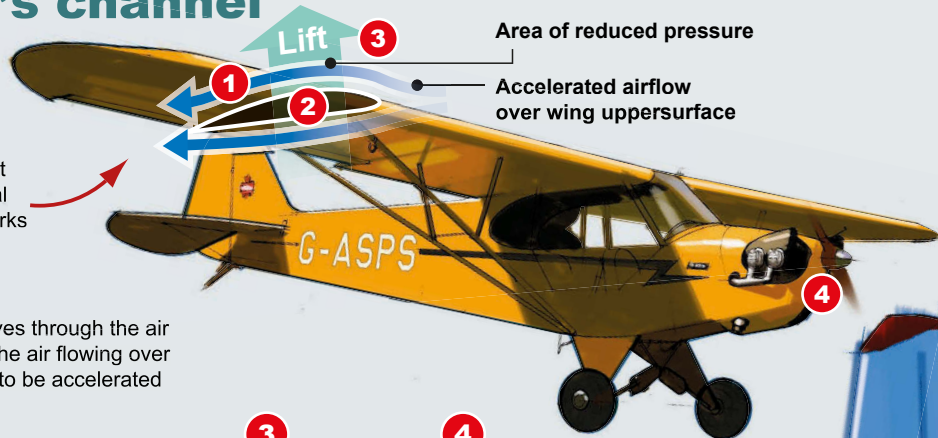
Meanwhile Custer had formed another company, the Custer Channel Wing Corporation, aimed squarely at designing and building a channel-wing-equipped aircraft for commercial certification. Although official testing had proved less than helpful to Custer, the eternally optimistic and strong-willed engineer was more determined than ever to prove the worth of his brainchild, described by Gilbert Taylor of Taylorcraft — a man who knew a thing or two about aviation — as "the first change in the basic design of aircraft since the Wright brothers". Custer may have been garnering glowing plaudits from distinguished members of the aeronautical community, but he was also fast running out of money and options — his next move would have to be boom or bust.

THE BIG TIME

In 1951, during the CCW-2's comprehensive test programme, Custer approached The Baumann Aircraft Corporation of Pacoima, California, which had successfully flown the prototype of its Brigadier, an attractive twin-engined five-seater, on June 28, 1947. Significantly, the Brigadier's two 125 h.p. Continental engines were arranged in pusher configuration, making the type a

Custer's channel wing

Before turning to the channel wing it's worth looking at how a conventional aircraft aerofoil works



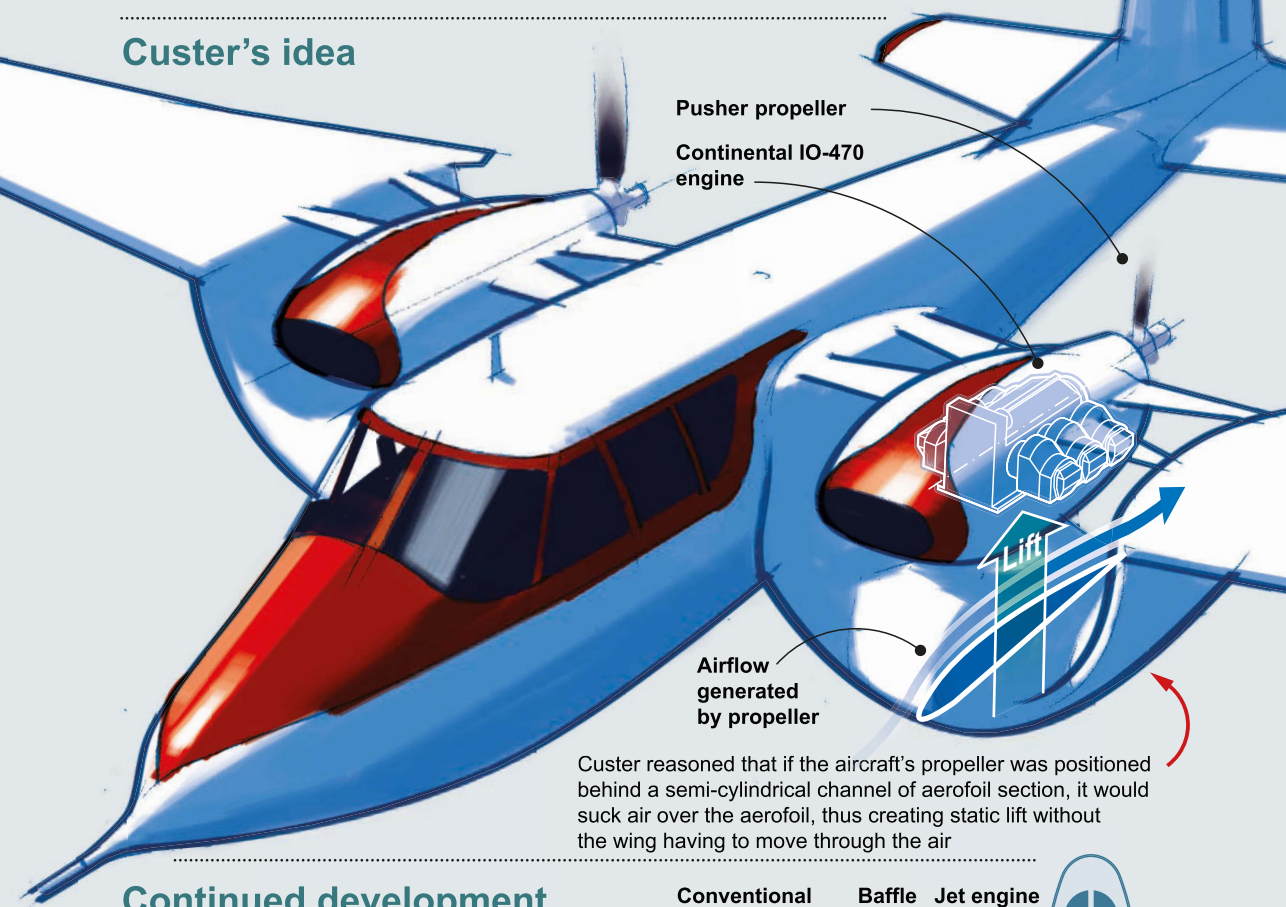
1 As an aerofoil moves through the air its shape causes the air flowing over the upper surface to be accelerated

2 The difference in the speed of the airflow over the upper and lower wing surfaces creates a pressure differential, lower pressure above the wing and higher below

3 This pressure differential creates an upward force, i.e. lift

4 A conventional aircraft's engine creates airflow by moving the aerofoil through the air. Hence the need to build up speed in order to create lift

Custer's idea

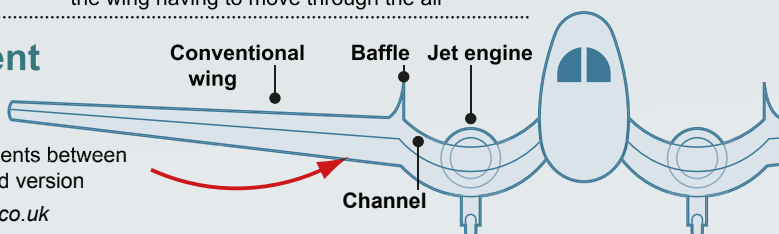


Custer reasoned that if the aircraft's propeller was positioned behind a semi-cylindrical channel of aerofoil section, it would suck air over the aerofoil, thus creating static lift without the wing having to move through the air

Continued development

Custer's fertile mind was continually coming up with channel wing-related developments and he filed numerous patents between 1929 and 1972, including this jet-powered version

Graphic: Ian Bott www.ianbottillustration.co.uk





LEFT Willard Custer demonstrates the sucking effect of the pusher-configured propellers over the port channel of the as-yet-uncovered CCW-2 with a ribbon. When first reported in the UK, in the January 4, 1952, issue of *Flight*, the tenor of the article was mildly sceptical: "The claims made by the Custer Corporation are, to say the least, sweeping . . ."

BELOW Custer clearly saw the channel wing as applicable to any type of aircraft, and used this model of a channel-wing-equipped twin-engine fighter-type to promote the concept. The model is seen here with just its channel wings fitted, but another model incorporated a larger wing with outer sections and a solid half-chord inner section.

BELOW With the windsock showing zero wind, the taildragger-configured CCW-2 pulls its tethers taut during a demonstration of its vertical-lift capabilities on December 7, 1951. Unfortunately for Custer, NACA's testing of the aircraft at Langley the following year focused heavily on this aspect rather than its conventional STOL performance, for which it had been specifically designed. HOWARD LEVY



TAH ARCHIVE





ABOVE The prototype five-seater CCW-5, N6257C, up from Custer's base at Hagerstown Municipal Airport in the summer of 1953, shortly after its maiden flight that July. Modifications were made to the prototype during the test programme, including extending the forward edge of the nacelles and reducing the diameter of their cooling inlets.

natural candidate for conversion to channel-wing configuration. Retaining the Brigadier's fuselage and tail assembly, a new airframe incorporating a 41ft (12.5m)-span wing with two 7ft (2.1m)-wide channels was built by Baumann and registered N6257C as the Custer CCW-5 prototype.

On July 13, 1953, test pilot Walker Davidson took the prototype CCW-5 aloft at Oxnard, California, for its maiden flight, the aircraft performing perfectly. The prototype's slow-flight characteristics were remarkable, and in August 1954 it was hovered out of ground effect against an 11 m.p.h. (18km/h) wind — a feat Custer capitalised on in his relentless promotion of the CCW-5, appearing on American television host Steve Allen's show *I've Got A Secret* with the claim that he had designed and built the world's slowest aircraft.

The next few years saw Custer and his team demonstrate the CCW-5 widely to prospective civil and military customers. By 1959 plans were in hand for a Canadian subsidiary, Custer Channel Wing of Canada Ltd, in association with Noorduyn, to manufacture 40 CCW-5s at Granby, near Montreal in Quebec, by the end of the following year; some 120 orders having been placed, mainly by bush operators impressed by the type's STOL capabilities.

Business was looking up. In Florida, overhaul and modification specialist American Airmotive announced its intention to convert a Curtiss C-46 to channel-wing configuration, the company predicting significant increases in cruise speed,

range and payload. The military also showed renewed interest, the CCW-5 prototype being demonstrated to tri-services representatives at the US Marine Corps base at Quantico, Virginia, in September 1959. During the trials the distinctive twin climbed out of a field at an angle of more than 30° after a ground roll of less than 200ft (61m) at 90 per cent of its maximum take-off weight. It also landed and came to a full stop within the same distance.

The ensuing report noted that the CCW-5's STOL performance was impressive, but that considerable pilot skill was required to make maximum-performance take-offs. The nose had to be rotated upward at exactly the right moment or the high-velocity airstream passing through the channels bounced off the ground and struck the empennage, creating a strong nose-down pitching moment. *Aviation Week* stated in its September 28, 1959, issue that the CCW-5 would be evaluated by the USAF's Air Research and Development Command "within the next three to four months", although it is not clear whether these trials were ever actually conducted.

With the prototype's performance impressing all who witnessed it, and a healthy batch of orders in place, Custer felt confident enough to sanction the construction of a second CCW-5, this one to be built at Hagerstown with help from local Fairchild engineers. This aircraft was to be more representative of the production version, with new parts fabricated from scratch rather than modifying existing Baumann items, as on



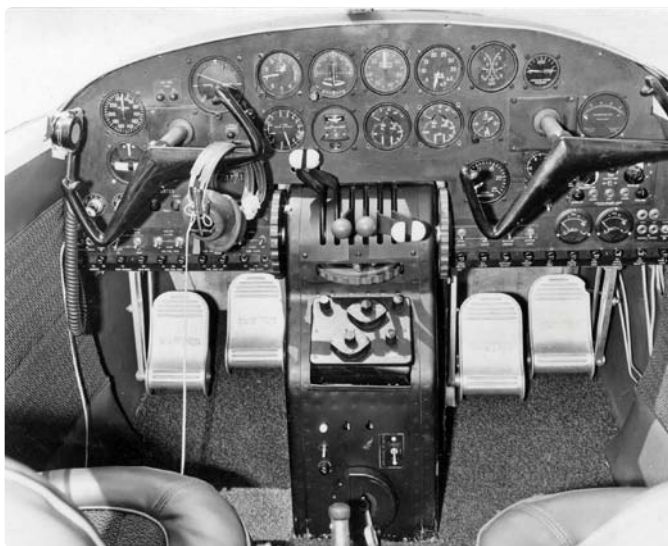
ABOVE LEFT The starboard channel wing and Continental engine of the first — and only — production CCW-5, N5855V. The channel incorporated a NACA 4418 aerofoil from the root to just outboard of the channel, and the outer wings were of NACA 4412 section.

ABOVE The nosewheel retracted forward and was fitted with a Goodyear 6-00 x 6 tyre (6in wide on a 6in-diameter wheel).

LEFT The dual-control cockpit of the CCW-5 was laid out conventionally, with no additional controls or instruments.

BELOW LEFT The short 6-50 x 10 mainwheels retracted into the outer surfaces of the channels, the wheels being exposed and standing slightly proud of the channels.

BELOW The rear of the port channel; both channels were more slender on the production example in order to reduce drag. Note how closely the propeller skims the channel's trailing edge.





ABOVE Production CCW-5 N5855V comes in for a landing at Hagerstown in 1964. In September that year Kevin Brown, Editor of *Popular Mechanics*, flew the aircraft: “As the plane loses speed, the nose comes up to hold altitude, and power is put back on. It’s like releasing the clutch and applying the accelerator in a stick-shift auto”.

the prototype. The engine nacelles underwent streamlining revisions, the span was reduced slightly, the strut bracing was simplified, the ailerons were moved further outboard and the rudder and aileron travel were increased.

Incorporating all these modifications, the first — and only — production CCW-5, N5855V, made its first flight on June 19, 1964. The new machine’s performance was much the same as that of the prototype, with a power-on stalling speed of 22 m.p.h. (35km/h), initial rate of climb of 1,600ft/min (490m/min) and a 22,000ft (6,700m) service ceiling. The latter dropped significantly to 5,000ft (1,520m) for single-engine operation, a factor which Willard Custer set about remedying — although events were about to overtake him.

THE END OF THE ROAD:

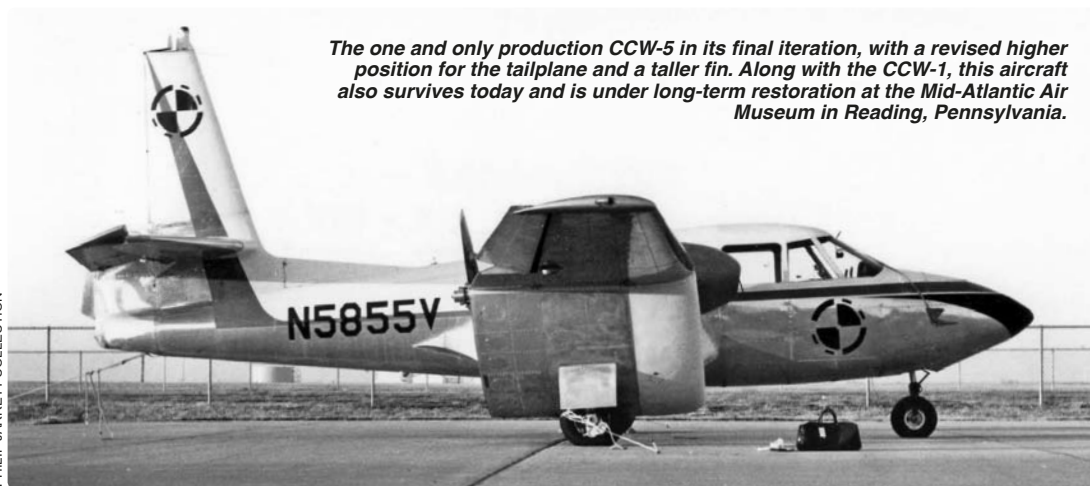
With orders on the books and certification by the Federal Aviation Administration (as the CAA had become in 1958) held up only by the latter’s insistence on the repositioning of the tailplane, which was moved to a higher location on a revised taller fin (actually impairing STOL performance), the future finally looked bright for the long-suffering Willard Custer. Seemingly vindicated after decades of financial hardship and official indifference, Custer was set to reap the benefit of all those hard years of struggle.

Enter the Securities Exchange Commission, which found irregularities in the issuing of the Custer Channel Wing Corporation’s stock. According to the US Court of Appeals report detailing the case, the “appellants [Custer] admitted having sold unregistered shares of Channel Wing stock, but maintained that the sales were a private offering”. “Even if it was a

public offering” the report continued, “there was no evidence of ‘willful’ violation of the court’s [previous] injunctive order.” The case rumbled on for years, but investors became nervous and, bit by bit, the rug was pulled out from under the business. The orders evaporated and the proposed fitting of channel wings to C-46s and Fairchild F-27 feederliners never happened. The curse of Custer had struck again; the company became bogged down in lawsuits and appeals, finally disappearing into obscurity in the late 1960s, with only the two CCW-5s built.

And that appeared to be that, until scientist and engineer Dennis Bushnell was appointed Research Director at NASA’s Langley Research Center in 1995. In Tim Wright’s article *That Extra Little Lift* in the May 2007 issue of *Air & Space* magazine, Bushnell related how he had inherited a pile of paperwork from his predecessor, which included a letter concerning “technical quibbles” relating to the testing of the CCW-2 at Langley in 1952. Intrigued, Bushnell dug into the history of the channel wing and was impressed by the concept’s potential.

A year or two later, while considering ways of getting aircraft into and out of small spaces, Bushnell had a moment of inspiration — why not combine the channel-wing idea with the concept of “circulation control”, a method of generating lift by using jets of air to improve the aerodynamic efficiency of a wing? Bushnell accordingly allocated funds for research to be undertaken at Georgia Tech in Atlanta, under the leadership of Bob Englar, who began investigating the possibilities of a “Pneumatic Channel Wing” (PCW), which, in theory, could be used to get a C-17 Globemaster III off a 60ft (18m) runway.



The one and only production CCW-5 in its final iteration, with a revised higher position for the tailplane and a taller fin. Along with the CCW-1, this aircraft also survives today and is under long-term restoration at the Mid-Atlantic Air Museum in Reading, Pennsylvania.

Using modern methods of computational fluid dynamics unavailable to Custer, Englar proved that by combining the channel wing with “blown flap” techniques, the drawbacks of the former system — flow separation caused by a number of factors, including the aerodynamic effects of the engine struts — could be substantially alleviated if not eliminated altogether. Thus one of the chief criticisms of the original channel-wing aircraft — an unusually nose-high attitude for landing — could be overcome. Englar’s official report on the work undertaken during 1999–2004 offers the following conclusion:

“The projected benefits [of PCW] suggest super-STOL and possible V/STOL capability with significantly increased payload, reduced noise signatures and increased engine-out control, all without variable geometry or mechanical engine/prop-tilting. A PCW aircraft thus equipped could provide a simpler, less costly way of achieving super-STOL or V/STOL capability without the complexity, weight or reliability issues of rotating the propulsion system, carrying large engines and rotors on the wingtips or thrusting downwards on fixed wings during hover”.

Whether or not we may yet see the channel wing — or a derivative thereof — employed on military and civil aircraft of the future is impossible to say, but it’s also impossible to rule out. As Bob Englar pointed out, “good aero ideas recycle” — a sentiment that would surely have found a great deal of favour with the doggedly determined Willard Ray Custer, who retained his fervent belief in the channel-wing concept until his death, aged 86, on Christmas Day, 1985, never having seen his idea come to fruition in the way he envisaged. When asked by magazine *Popular Mechanics* in September 1964 how he kept going after each disappointment, he had given a characteristic response:

“At first I just got mad; then I realised that I was just too far ahead of my time — and went back to work . . .”



CUSTER CCW-5 DATA

Powerplant 2 x 250 h.p. Continental IO-470-T six-cylinder horizontally-opposed air-cooled engines, each driving a Hartzell HC82X20 constant-speed fully-feathering propeller

Dimensions

Span	
(prototype)	41ft 2in (12·55m)
(production)	40ft 1½in (12·23m)
Length	
(prototype)	28ft 8½in (8·75m)
(production)	30ft 9in (9·35m)
Height	
to top of rudder	10ft 10in (3·3m)
to top of cabin	6ft 9in (2·05m)
Wing chord	6ft 0in (1·83m) at outer edge of channel section; 3ft 0in (0·91m) at tip
Wing area*	209ft² (19·4m²)
Channel area (total)	132ft² (12·26m²)
Dihedral	4° on outer panels
Tailplane span	13ft 3½in (4·05m)
Undercarriage track	14ft 10in (4·52m)

Weights

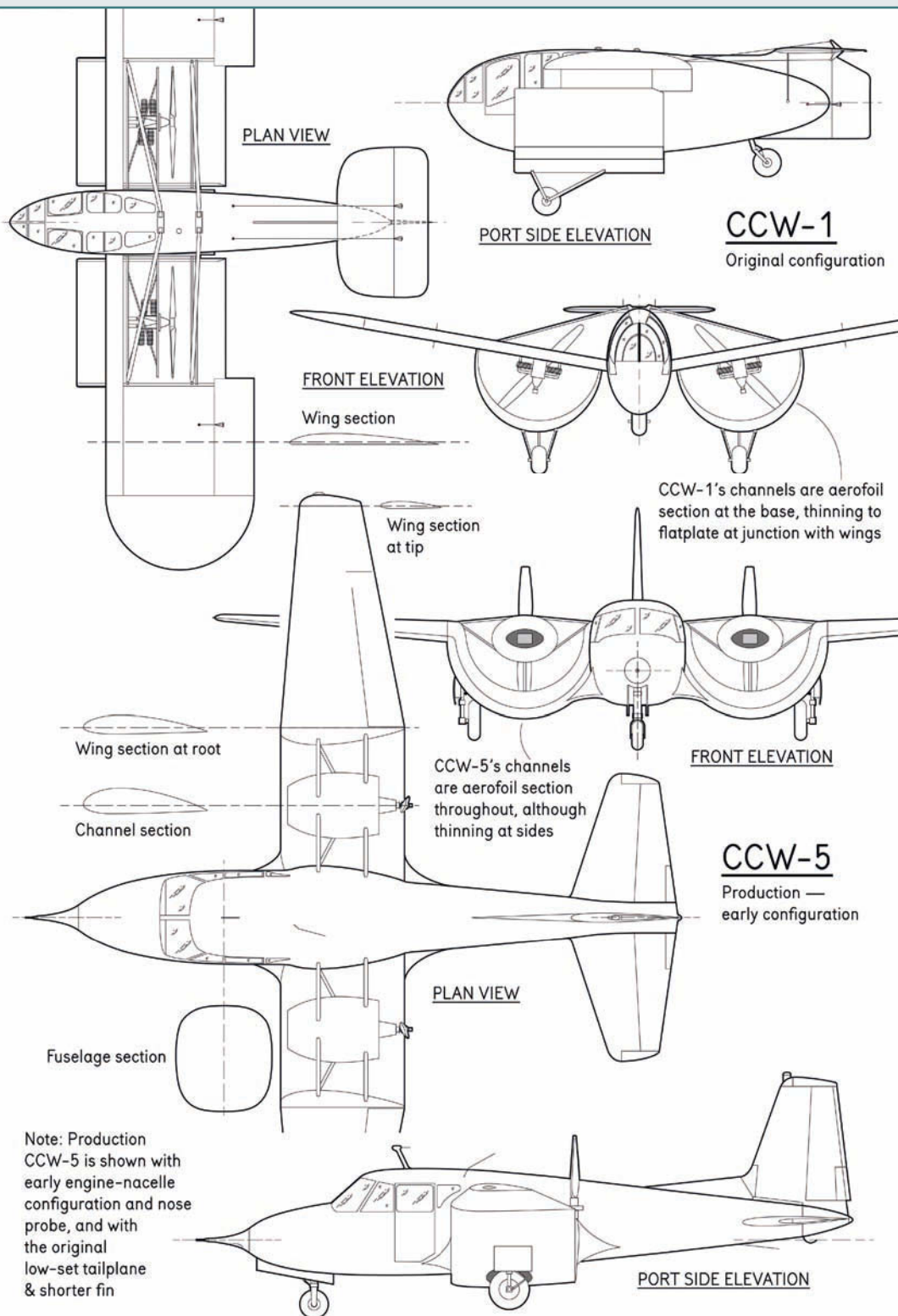
Empty	
(prototype)	3,675lb (1,667kg)
(production)	3,200lb (1,452kg)
Max take-off	
(prototype)	5,400lb (2,450kg)
(production)	5,000lb (2,265kg)

Performance*

Maximum speed	200 m.p.h. (322km/h)
Cruise speed	180 m.p.h. (290km/h)
Stall speed, power on	22 m.p.h. (35km/h)
Normal take-off distance to 50ft	250ft (76m)
Landing distance from 50ft (15m)	350ft (107m)
Climb	1,600ft/min (490m/min)
Service ceiling	22,000ft (6,700m)
Normal range	1,100 miles (1,770km)

* production aircraft

Source: *Jane's All The World's Aircraft 1964–65*



Custer CCW-1 & CCW-5

Drawn & Traced by
E.L. LEA ORMEROD

Feet 10ft
Metres 3m



ARMCHAIR AVIATION

We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics

Into The Black — The Extraordinary Untold Story of the First Flight of the Space Shuttle and the Men Who Flew Her

By Rowland White; Bantam Press, 61–63 Uxbridge Road, London W5 5SA; 6½in x 9in (165mm x 233mm); hardback; 436 pages, illustrated; £18.99. ISBN 978-1-59306-436-8

THE MEN WHO built the six Space Shuttle vehicles were experienced aircraft-makers working with one of the most prominent companies in American aviation history. Formed from a conglomerate of several companies in the mid-1930s, North American Aviation had built numerous world-class game-changing aircraft when, in 1972, it was selected to manufacture the Shuttle Orbiter, the first winged vehicle designed to fly to and from low Earth orbit and land like a conventional aeroplane.

To the casual observer, the Shuttle Orbiter was a delta-winged vehicle strapped to the side of an elongated propellant tank, which was attached to two solid rocket boosters in a parallel-burn configuration, the two solids and the three cryogenic rocket motors in the tail of the Orbiter all firing at lift-off. To the discriminating engineer it was one of a kind. Nobody had built such a thing before; there was no precedent to learn from and no parallels by which to gauge it. It was, and remains, a unique demonstration of innovative aeronautical technology.

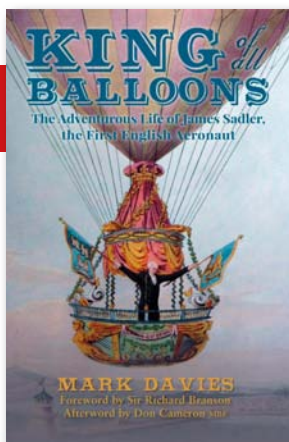
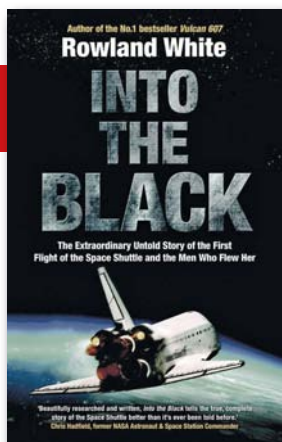
The story of the Space Shuttle has been told many times before, always from the perspective of it being a spacecraft — a reusable vehicle designed to carry people and cargo to and from space. But the real essence of the design is that it was primarily an aircraft designed to go into space and support a nominal seven-person crew, and, as such, was designed and engineered more as an aeroplane than a true spacecraft. Thus it has acute relevance to the aeronautical fraternity.

Coming from the pen of an award-winning author, this book is a narrative story with an easy page-turning style crafted to keep the

reader engrossed. It is not a technical book by any means and, in this instance, all the better for it, telling the story of the preparation for the first flight and the potential hazards faced by the crew when it was discovered, in orbit, that several thermal tiles had separated during launch. The crew could only see aft to a limited degree, but what they saw gave cause for grave concern about the ability of the vehicle to return its crew safely to Earth.

The book focuses on the close ties between the USA's civil and military space programmes, weaving a path through “black” projects involving satellite reconnaissance and orbital surveillance, and the desire on the part of the USAF to put its pilots in space. The author does a credible job of explaining the close-run race between manned and unmanned spy satellites, linking the astronauts selected to occupy the Manned Orbital Laboratory (MOL) with the emerging Shuttle concept. When MOL was cancelled these were assigned to NASA and learned to fly the Orbiter, which they helped to crew on its early flights. And it is here that the separate strands draw together. When the Shuttle pilots on the first flight noticed that tiles were missing, they received help from the unmanned spy satellites which previously had won out over MOL — but for that story you will have to read the book! It reads like a thriller, but it is all verifiably true and sound to the core.

In the interests of full disclosure I have to admit to a personal involvement here. Rowland came to me several years ago with the idea for this book and wanted to know more about the Shuttle. I was sceptical, but only because of his self-confessed lack of knowledge on these vehicles and their systems. I should have known better. The author of *Vulcan 607* has brought the same nuanced connection with his subject evident in that fine book to this account of the first Shuttle mission. It is a riveting story — and one replete with facts few involved in the programme would even know about.



When the Shuttle first flew, it was estimated to have a loss probability of 1 in 1,000. After 135 launches, when NASA re-examined the failure-probability rate based on a wealth of flight experience and the loss of two Orbiters, it reassessed the probability of loss on that first flight as one in nine. This book should be read in light of that spine-chilling fact.

Dr DAVID BAKER

King of All Balloons: The Adventurous Life of James Sadler, The First English Aeronaut

By Mark Davies; Amberley Publishing, The Hill, Stroud, Glos GL5 4EP; 6½in x 9½in (165mm x 241mm); hardback; 336 pages, illustrated; £20. ISBN 978-1-445653-08-2

A BIOGRAPHY OF Oxford balloonist James Sadler was long overdue, but the omission is now resolved with a vengeance, as this volume covers not just James Sadler, but also his balloonist son, Windham, the Sadler family in general and even (among the nine appendices) Lunardi, Blanchard, Mrs Sage, Harper, Harris and George Graham.

The main text is chronological, so it is easy to trace specific ascents, from James's first, in 1784, to Windham's last, fatal, voyage on September 29, 1824. The author, a local Oxford historian, has been thorough in his research, embracing many local newspapers of the period as well as national archives and many of the familiar classic ballooning histories. His text is supported by 27 pages of informative notes and references, and a 16-page glossy-page section of monochrome and colour illustrations. Unfortunately many of the colour reproductions are grey and dark, and the vitality of the old original prints is often lost owing to poor copying or printing.

A good quantity of quotations in the wonderful style of reportage in use at the time enlivens the text, providing entertaining insight into the

behaviour and mannerisms of those eventful days. In addition to his pioneering balloon ascents (he travelled faster than any man in history up to that point on October 7, 1811 — 112 miles in 1hr 20min — and was the first man to cross the Bristol Channel by air), James Sadler displayed expertise as an engineer, chemist and weaponry developer, and the vicissitudes undergone by him and his family are recounted in some detail.

I encountered one curious anomaly in the index, relating to a character in which I have a particular interest, Bishopsgate ironmonger Isaac Earlysman Sparrow; not only was the "s" missing from his middle name, but the page number given was the index page itself!

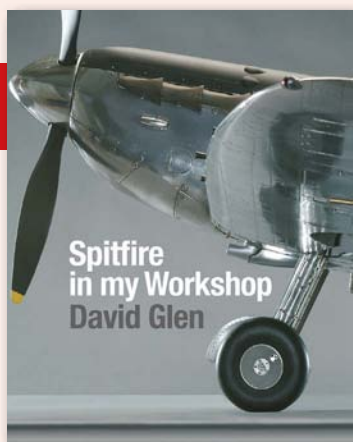
PHILIP JARRETT

The Kamikaze Hunters: Fighting for the Pacific, 1945

By Will Iredale; Pan Macmillan, 20 New Wharf Road, London N1 9RR, 6½in x 9½in (155mm x 241mm); hardback; 386 pages, illustrated; £20. ISBN 978-1-447284-71-0

THE BRITISH PACIFIC Fleet's successful operations against Japanese oil installations on Sumatra led to the Americans "inviting" the Fleet to support their invasion of Okinawa and then protect the left-flank of their invasion force. In doing so the British Fleet encountered the terrifying and nightmarish onslaught of Japan's determined *kamikaze* (divine wind) pilots. The American Chief of Naval Operations, Admiral Ernest J. King, had been vehemently opposed to British involvement. There is an irony in that the majority of Fleet Air Arm (FAA) squadrons in the Pacific flew American-designed and -built aircraft and almost half of the FAA's airmen had been trained in America.

The defeat of the Japanese in East India and Burma by the British Fourteenth Army is little



known; the actions and sacrifices of the British Pacific Fleet even less so. "If the armies of Burma were the forgotten army, then we were the forgotten fleet", recalls Keith Quilter, a former pilot with No 1842 Sqn embarked in *HMS Indomitable*.

It was a chance meeting with Quilter that prompted *Sunday Times* journalist Will Iredale's interest in the British Pacific Fleet. Iredale's curiosity piqued, his research led him to contact numerous veterans, sailors as well as aircrew, and their relatives. It is their recollections that are the heart and soul of this book. Their testimony and excerpts from letters and diaries add a human dimension that prevents this from being a dry textbook.

The author honestly portrays the hatred the British pilots harboured for an enemy whose fanaticism they could not understand, and the description of some aircrews' actions after a kamikaze attack on *HMS Illustrious* may seem gratuitously ghoulish. As one pilot explained, he was "not exactly proud" of what he did, but "we were all very young, we hated the enemy; it was kill or be killed".

This is a well-researched and thoroughly readable book, although the title is slightly misleading. "Kamikaze Hunters" is an exciting and effective arrester-hook to catch a general readership but does not really fit the story. The kamikaze attacks of the title occupy the final third of the book. That is not a negative criticism. The preceding personal stories of the aircrews' backgrounds, training, introduction to life on aircraft carriers and combat are supported by relevant technical, historical and political information and make engrossing reading. It would be a shame if the book's title and *Boys' Own*-style cover deterred the aviation enthusiast or historian. Good books about the Fleet Air Arm during the Second World War are few and far between, and this is one of them. It is well produced with an easily-read typeset and illustrated with 38

photographs, mostly from veterans' private collections and published for the first time.

A veteran pilot told Iredale: "Everybody has a story. Life is like that. But unless somebody writes it down, when they die, the story dies with them". *The Kamikaze Hunters* goes a long way to ensuring that the stories of the forgotten crews of the British Pacific Fleet will live on; and they assuredly deserve to be heard.

GARY BARTLETT

Spitfire in my Workshop

By David Glen; Brown & Brown Books, Borley Mill, Sudbury, Suffolk CO10 7AB; 13in x 10in (325mm x 255mm); hardback; 192 pages, illustrated; £39.99. ISBN 978-0-952690-72-6

NEXT TIME YOU find yourself in the entrance hall of the RAF Museum's main building at Hendon, make sure you have a look at the 1/5th-scale natural-metal Spitfire model in the big display case. It's not just any Spitfire model — it's a very special 11-year labour of love; and, unusually for a model aircraft, its creator has written a whole book to tell its story.

A pictorial tour of the model opens the proceedings, luscious photographs by Roger Hancock sucking the reader into its miniature world with the same glorious rush as Alice going down the rabbit-hole. Then begins the back-story and an almost rivet-by-rivet (all 19,000 of them!) account of the many different techniques and processes employed in building this masterpiece. Having been a Duxford Aviation Society volunteer in his younger days, author/modeller David Glen went on to a career as a Fleet Street journalist (of which more later) and then a marketer, so the text moves along with style and pace. It quickly becomes apparent that this is a book not just about a model, but about the craft and philosophy of modelling — the initial

SCALE AIRCRAFT MODELLING

Edited by Gary Hatcher, e-mail blisterwhelm@outlook.com; 11¼in x 8¼in (297mm x 210mm); 88 pages, illustrated; £4.50 per issue, £49.50 for annual UK subscription (12 issues). Website www.scaleaircraftmodelling.co.uk

LAUNCHED IN 1978 as a spinoff from Alan W. Hall's *Aviation News* fortnightly, *Scale Aircraft Modelling* has steadily developed from a mostly black-and-white "newspaper" format which reflected its ancestry to the glossy, full-colour offering of today. Aimed squarely at plastic modellers (kit, conversion/superdetailing and scratchbuilding), it encompasses modelling techniques, product reviews and reference material.

June 2016's issue, which was current as *TAH* went to press, is centred around the regular *Aircraft in Profile* section, which usually comprises scale drawings, colour side-view artworks and potted history of a specific aircraft type. This time, though, it focuses on the aircraft of the USAF's 21st Tactical Fighter Wing, sacrificing the drawings in order to cover three types, the F-86, F-100 and F-84. Other features include RAF Middle East uppersurface camouflage in 1939–41; modelling the Tupolev Tu-4 testbed which had a Tu-91 ground-attacker fuselage section mounted in the starboard inner engine position; superdetailing a 1/32nd-scale F/A-18 Hornet kit; and adding *Gorgon Stare* sensor pods to an MQ-9 Reaper drone kit. Splendid stuff, and there is lots more that we don't have space to mention here. **MO**



inspiration or "I've-just-got-to-make-a-model-of-that!" moment; the endless quest for good reference material; the need to embrace patience and repetitive work; the attention to fine detail; the pragmatic, practical problem-solving that is the hard-won skill of any great scratchbuilder or detailer; and the need for that small touch of insanity, or at least recklessness, which makes one embark on the time-consuming, potentially divorce-inducing but utterly absorbing and satisfying activity of modelling.

Encased in gleaming litho plate — the thin aluminium sheets used in printing-presses, a neat link with Glen's publishing-industry past — the Spitfire is, surprisingly, not metal throughout; it is actually based on a balsa-and-foam radio-controlled flying scale model kit, albeit heavily modified. One can't help feeling that in some ways it would have been simpler to start with just a set of Supermarine factory drawings and make everything from the ground up. The lack of paint (other than internally and on a few details) emphasises the aircraft's iconic form and the jewel-like surface detail.

A quick look at some of Glen's other models, plus an autobiographical section, wrap up this book — the appeal of which will extend far beyond the modelling community.

MICK OAKLEY

Battle of Britain: Combat Archive Volume 1 (10 July–22 July 1940) & Volume 2 (23 July–8 August 1940)

By Simon W. Parry; Red Kite, PO Box 223, Walton-on-Thames, Surrey KT12 3YQ; 8½in x 12in (211mm x 300mm) softback; Vol 1, 128 pages; Vol 2, 256 pages, illustrated; both £25. Vol 1 ISBN 978-1-906592-28-8, Vol 2 978-1-906592-30-1

GIVEN THAT THE Battle of Britain has been covered to the point of utter banality, does the

world really need yet another dissertation on Dowding's "finest hour"? A look at the first two parts of Red Kite's ambitious new 12-volume *Battle of Britain Combat Archive* series prompts a resounding and very refreshing "yes".

Defiantly asserting in the introduction what the series is NOT about — the rebirth of the Luftwaffe; the invention of radar; the organisation of the Luftwaffe and/or Fighter Command; aircraft specifications; the Royal Observer Corps (to name a few) — the author goes on to clarify that this is a serious attempt at providing a properly researched blow-by-blow account of the aerial combats fought over the UK and its coastal waters during the Battle of Britain, defined as July 10–October 31, 1940.

Devised by Luftwaffe and Battle of Britain specialist Simon Parry and renowned aviation artist Mark Postlethwaite, the layout of each volume follows a logically set pattern, with each individual day of the Battle being given its own chapter, which is then divided into clearly defined sub-sections. The latter include details of individual combats and personnel (RAF and Luftwaffe), pilots' first-hand accounts, intelligence reports and, significantly, previously unpublished daily victory claims for both sides.

In terms of illustrations, each chapter is prefaced with a dramatic depiction of one of the relevant day's actions by aviation artist Piotr Forkasiewicz; easy-to-read maps include representations of cloud cover and prevailing weather at the time of each combat, and there are copious colour profile artworks of the relevant aircraft accompanying numerous photographs and gun-camera stills. For those who don't want more "there I was at 30,000ft" yarns, but are looking for a reliable source of meticulously researched hard information on the Battle presented in a sober and user-friendly manner, you won't do better than to invest in this impressive series with quality at its heart.

NICK STROUD



BOOKS IN BRIEF

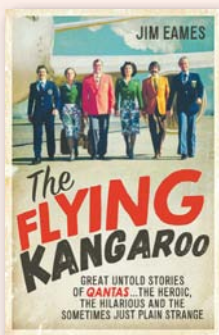
A quick round-up of what else is currently available for the aviation history enthusiast

THE FLYING KANGAROO

Jim Eames

Allen & Unwin; ISBN 978-1-760113-55-1; £15.99

SUBTITLED "Great untold stories of Qantas . . . the heroic, the hilarious and the sometimes just plain strange", this collection of anecdotes from the history of the world's safest airline does exactly what it says on the tin. The author is the former Director of Public Affairs for Qantas, and has gathered a hugely entertaining collection of yarns from former staff and those closely involved with the airline since its birth. It could have done with a bit of judicious editing (C.G. Grey was Editor of *The Aeroplane*, not "Aeroplane & Aviation"), but this is great fun nevertheless. **NS**

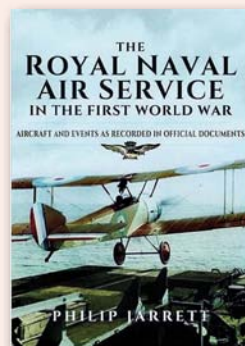


THE ROYAL NAVAL AIR SERVICE IN THE FIRST WORLD WAR

Philip Jarrett

Pen & Sword; ISBN 978-1-473828-19-3; £30

NOT INTENDED as a definitive history or analysis of the RNAS and its role during the Great War, this is essentially a reproduction of five original documents relating to the Service's work in the conflict. It includes diaries, disposition lists, communiqués, truing-up details and the Grain drawings — a unique set of sketches made by a draughtsman at the RNAS seaplane repair station on the Isle of Grain. With numerous photographs, many previously unpublished, and full-page reproductions of original documents, this is a must for serious students of the RNAS. **NS**

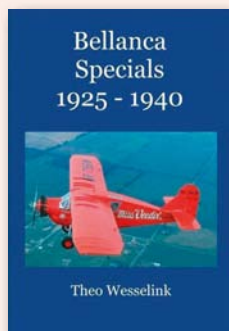


BELLANCA SPECIALS 1925-1940

Theo Wessellink

Dutch Aviation Publications; ISBN 978-9-491993-02-2; €49.95 via www.blurb.com

FOR THOSE intrepid souls determined to set new endurance and/or distance records during the "Golden Age of Aviation", the aircraft of choice was (nearly) always a Bellanca monoplane. Numerous epic, now largely forgotten, flights were made in one-off Bellancas and the author has done an admirable job of gathering together the stories of more than 40 of these "Specials", from the 1925 Wright-Bellanca WB-1 to the comic-bookish three-engined 28-92 racer of 1937. The research is excellent, the stories are pure adventure-book stuff and the photographs are rare. An index would have made this very good book a great one. **NS**



SUPERMARINE: AN ILLUSTRATED HISTORY

Christopher Smith

Amberley Publishing Ltd; ISBN 978-1-445651-24-8; RRP £12.99

ANOTHER IN Amberley's ever-lengthening line of softback potboilers, in which 100 or so rather flat black-and-white photographs tell the story of a given subject with a bit of context provided at the beginning of each chapter. Written by Solent Sky Museum's Christopher Smith, who knows his subject and writes engagingly, this is a gallop through the history of Supermarine, from its establishment by Noel Pemberton Billing (his name was not hyphenated, as it is throughout in this book, although his company was) through the development of the Spitfire to the Swift and Scimitar jets. **NS**



SPITFIRE EVOLUTION

Paul Beaver and Jon Freeman

Beaver Westminster Ltd; ISBN 978-0-993554-50-6; RRP £15

THIS NEAT, almost pocket-sized (5½in x 8½in), softback by renowned aviation author Paul Beaver details the development of every Spitfire variant from the small, agile prototype of 1936 through to the monstrous post-war Seafire 47. Artist Jon Freeman provides profile artworks of each of the 60+ variants and sub-variants, and a very useful seven-page section with plan and underside views details the type's mind-spraining wing evolution (A, B, clipped etc etc). **NS**



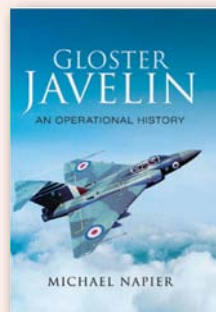
GLOSTER JAVELIN

An Operational History

Michael Napier

Pen & Sword; ISBN 978-1-473848-81-8; £25

AS THE TITLE suggests, this history of "the old drag queen" is written from the perspective of the big delta's service career, with an emphasis on first-hand accounts from those who flew the beast. A former RAF fast-jet pilot himself, the author has put together a highly-readable and satisfying account of the Javelin's comparatively short (1956-68) front-line career, with a comprehensive selection of photographs which are adequately, if not sparkingly, reproduced. **NS**



Lost & Found

PHILIP JARRETT explores the lesser-known corners of aviation history, discovering unknown images and rediscovering long-lost details of aircraft, people and events. Here he takes a closer look at a recently-acquired postcard to discover an intriguing “rara Avis”

IN MARCH THIS year I purchased this postcard at a local ephemera fair because it aroused my curiosity. Once I started to do some research I found out why. It did not take long to confirm that the photograph was taken at the Scottish International Flight Meeting at Lanark in 1910; the hangar for Colmore's aeroplane in the background was distinctive. The aeroplane, however, was another matter.

I was certain that it was a Howard Wright Avis monoplane, as it had the simple bracing pylon and twin wheels on each undercarriage skid that distinguished the type, but I was puzzled by the long tubular radiators attached to the undercarriage struts beneath the wing roots, and the engine appeared to be a vertical water-cooled inline with perhaps four cylinders, a type not usually associated with the Avis.

A look at British weekly magazine *Flight's* two-part coverage of the Lanark meeting did not help. It was mentioned that The Hon Alan Boyle's Avis was “on its way” to Lanark, but nothing more. I found the solution in the August 17, 1910, issue of *The Aero*, wherein it was reported that, on Tuesday August 9, “. . . Gilmour [Douglas Graham Gilmour, who had learnt to fly on a Blériot monoplane in France, and was awarded Aéro Club de France Brevet No 75 on April 19, 1910] brought out the Avis No 2, with a Green engine, for some trials”. The reporter stated that the aircraft “has now been fitted with a Blériot control, and gives promise of doing well. Gilmour only managed to make quite short flights, but he told me he was very pleased with the way in which the machine handled, and thought he would probably be able to do quite good flights with her by the end of the week”.

THE MYSTERY BIRD

That was all there was; the machine did not reappear in the report, so perhaps it failed to perform as hoped. Because it was a late arrival at the event it was not included in the published lists of entrants, so it largely escaped attention.

None of the books on British pioneer aeroplanes mentions a Green-engined Avis,

and there is no reference to it in A.E. Tagg's book on the Green and ENV engines, *Power for the Pioneers*, which has an otherwise comprehensive list of Green-powered machines. The engine must have been either a 30/35 h.p. or 50 h.p. model.

So far, I have not traced another image of this “rara Avis” with its distinctive engine and radiators, so we have only this view of its centre section. It would be nice to see the whole aircraft. Moreover, I have yet to identify the occupant for certain. It is definitely not Gilmour.



BELOW The only image so far found of the elusive and little-known Green-engined Howard Wright Avis No 2 monoplane, taken at the Scottish International Flight Meeting at Lanark in the summer of 1910. Who is the gentleman at the controls? If you can provide any clues or information, please contact the Editor!





Macchi's SKY SCOOTER

The Nieuport-Macchi M.16 and the US Navy

In 1921 the US Navy purchased three examples of the diminutive Nieuport-Macchi M.16 floatplane to evaluate the use of the type on its destroyers and submarines. Despite the tiny biplanes showing a great deal of promise, the concept had inherent limitations and was ultimately abandoned — as Italian aviation historian **GREGORY ALEGI** relates



DESCRIBED AS AN “economical single-seat sport ‘plane and trainer”, the Nieuport-Macchi M.16 was designed by the firm’s technical director Alessandro Tonini (1885–1932), and entered in the 1919 Touring Aircraft Competition launched by Italy’s *Lega Aeronautica Nazionale* (National Aviation League — LAN). In order to minimise hangarage costs, the rules limited the span to 6m (19ft 8in), with engine displacement set at 3.75lit, to reduce fuel consumption. These requirements naturally led to very small aircraft.

The M.16 was just over 4m (13ft 1in) long, with an empty weight of only 160kg (350lb), justifying the “motorcycle of the sky” nickname bestowed on it by the press. It had an all-wood structure, with a rigid truss fuselage that eliminated internal bracing wires and the copious turnbuckles found on the company’s First World War aircraft. The constant-chord biplane wings carried ailerons on the lower planes only. Construction work proceeded quickly.

The earliest general arrangement drawing is dated July 1, 1919, and specifies a two-cylinder flat-twin 40 h.p. ABC Gnat engine. Static tests were completed in Varese that September with a wheeled airframe fitted with a 30 h.p. three-cylinder Anzani. On reaching a load factor of ten a strut bowed slightly, but a lack of sandbags prevented the test from continuing to 11, where the structure was expected to fail. The aircraft had possibly already flown, but the date, place and name of the pilot are apparently lost.

VICTORY ~ AND FOREIGN INTEREST ...

The LAN competition was held during July 5–7, 1920, at Taliedo airfield, near the present Linate airport in Milan. Nieuport-Macchi brought two M.16s, one with an ABC engine and the other Anzani-powered, which competed against the Breda-Pensuti triplane and the Ricci R.6, which had arrived from Naples at the last moment. Three other machines — the Bergonzi “Ardea” canard aircraft, Sarri “Vampiro” triplane and a Gabardini biplane — missed the deadline.

Flown by Giovanni De Briganti, the Anzani-powered M.16 came in first with 82 points of a possible 90, trailed by the Breda-Pensuti flown by Ludovico Montegani (who accrued 80 points) and the Ricci flown by Bruno Albertazzi (74). This success was followed by M.16 victories in the 1920 and 1921 Mapelli Trophy races for touring aircraft.

According to the fiery Italian weekly



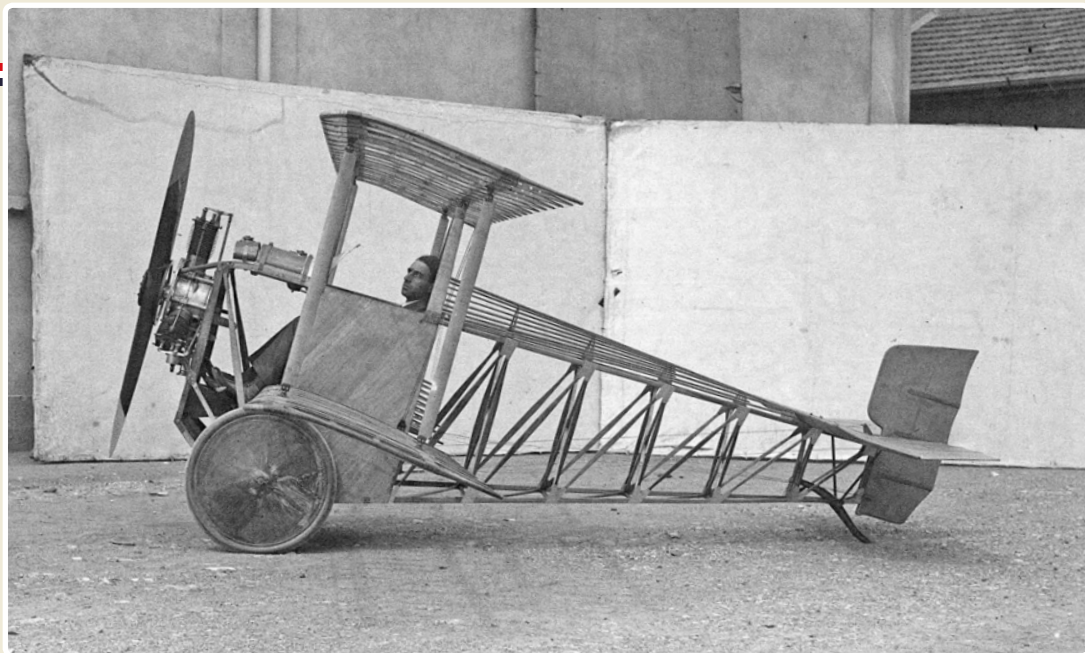
ABOVE An example of an original wheeled M.16, with a three-cylinder Anzani engine, in flight in Italy. Giulio Macchi founded the *Società Anonima Nieuport-Macchi* in 1913, primarily to build Nieuport designs under licence, but from 1916 the company began producing its own highly successful series of aircraft designs.

publication *Gazzetta dell’Aviazione*, the victory in the LAN competition brought Nieuport-Macchi orders for 12 aircraft from the Italian government and more than 20 for the USA. The first order is confirmed by a photograph of a dozen M.16s with Italian military and civil registrations, but the American sales are unconfirmed.

Nevertheless, the diminutive flying machine ultimately did come to the attention of the American authorities. The US Navy fully understood the potential effectiveness of an aircraft/ship combination and was already experimenting with it in every possible form. This included placing aboard submarines and destroyers small reconnaissance aircraft capable of being deployed from water and with their own recovery equipment, and which required minimal maintenance and storage space. The M.16 floatplane variant offered in 1921 with an Anzani engine fitted the bill perfectly.

Nieuport-Macchi developed a nautical variant, which it advertised as the world’s smallest seaplane, by replacing the wheels of M.16

OPPOSITE PAGE One of the three Nieuport-Macchi M.16s acquired by the US Navy in the early 1920s undergoing water trials at Hampton Roads in Virginia. The M.16 was one of five types, of simple but rugged design, tested by the US Navy for use aboard its destroyers and submarines. In the event none was ever used for the intended role.



ABOVE This photo of an M.16 without skinning shows the inherent simplicity Tonini (who is in the cockpit) brought to the design. The constant-chord single-bay unstaggered wings had a span of 6m (19ft 8¼in) and an area of 11.3m² (122ft²).



LEFT Showing its bulged lower fuselage and an added dorsal fin to improve lateral stability, M.16 I-BAGC (c/n 3090) is seen here at some point after its registration in October 1922.

BELOW The two gentlemen standing beside the red M-16 civil prototype at Malpensa emphasise the type's diminutive size. Weighing less than 300kg (660lb) fully loaded, the M.16 had a top speed of 120km/h (75 m.p.h.).





ABOVE The three floatplane variants of the M.16 acquired by the US Navy were given the Bureau Numbers A-6005 to A-6007. According to original Macchi documents the type had an endurance of 3½hr, but the fitting of floats would have affected the performance of the tiny biplane, which stood less than 7ft (2.1m) tall, including the floats.

c/n 3051 with a pair of 2.8m (9ft 2in) floats. The empty weight rose to 200kg (440lb) and the top speed dropped by 10km/h (6 m.p.h.), but things remained otherwise largely unchanged.

Exactly how Macchi came to be involved in the US Navy procurement process is unknown, but it is probably significant that just three years earlier many Americans had gained their wings on various Macchi types at the flying school at Lake Bolsena in central Italy, before proceeding to serve operationally at Porto Corsini, near Ravenna, on Macchi M.5 seaplane fighters and M.8 reconnaissance seaplanes. Ensign Charles Hamman flew an M.5 in the rescue action for which he was awarded the first Medal of Honor awarded to a US naval aviator, in August 1918. Two M.5s had also been evaluated during 1917–18 at Hampton Roads Naval Air Station in Virginia. All this certainly created links which were quickly put to good use when the US Navy's new requirement cropped up.

STIFF COMPETITION

In parallel with the testing of the M.16, the US Navy also tested several other biplanes. The first was designed in-house by the Bureau of Aeronautics to be built by commercial firms in all-wood or aluminium versions, which became respectively the Cox-Klemin XS and Martin MS. Both were powered by a three-cylinder L4 engine made by the Lawrance Aero Engine Co (later to become part of Wright Aeronautical), and had rigid bracing rather than wires in order

to simplify their assembly and dismantling.

The L4 also powered the J.V. Martin K-IV, a tiny landplane designed in 1917 which reappeared in 1921 in seaplane form with its power doubled to 60 h.p. to compensate for the weight and drag of the floats. The Caspar U-1 was acquired from Germany and sported a 60 h.p. five-cylinder Siemens engine; significantly, its impressively modern cantilever wings eliminated struts and rigging altogether.

The US Navy purchased 20 aircraft to the specification in all, including six XS, six MS, three K-IVs, two U-1s and three M.16s, the latter receiving serials from A-6005 to A-6007. All were tested at Hampton Roads. As the American naval attaché in Rome wrote in November 1922: "During the last two and a half years this machine [the M.16] has proven itself to be very serviceable and satisfactory", although he also noted that it was "doubtful" whether the installation of floats would allow it to "render efficient service as a seaplane, except in quiet water". The attaché's judgment applied equally well to the entire group of aircraft, none of which found practical use.

At least one US Navy M.16 reached the American civil register, exchanging its military serial, A-6006, to become NC10043 as the "Nieuport-Macchi Sport" — an apt description for the pocket-sized machine. Its subsequent life is unknown. Perhaps its small size saved it and it patiently waits to be rediscovered in an American barn . . .





PHOTOGRAPHS BY THE AUTHOR

OFF THE BEATEN TRACK

Ever turned a corner to find something unexpected? The Aviation Historian's intrepid aeronautical explorer **PETER DAVISON** investigates the stories behind the oddities that turn up in the most unusual places

A TOTAL OF 45 Ilyushin Il-14 transports operated with the Vietnamese People's Air Force from the establishment of No 919 Transport Regiment in May 1959. Two of the first three delivered in 1958 still survive in Hanoi. Given the NATO reporting name *Crate*, the type first flew in July 1950, and more than 1,100 examples were built, the majority in Moscow and Tashkent, licence arrangements in East Germany and Czechoslovakia accounting for some 283.

The example above, marked VN-C482, is preserved outside the Hang Khong building — the home of Vietnam's civil aviation administration — beside an Antonov An-2TD, a few miles from Gia Lam, a still-functioning transport base in the eastern suburbs of Hanoi. I tracked it down in 2010; imagine my surprise when, on researching a return visit in 2016, I found links to "C-482" in a different location — the Hanoi Military Museum.

The plot thickened. There were two Il-14s, both marked C-482. The museum example is described on its adjacent information board as "one of three Il-14s used by No 919 Regiment to transport President Ho Chi Minh and leaders of the party and state of Vietnam on business [sic] trips between 1960 and 1964".

ABOVE *Crate expectations* — Ilyushin Il-14 VN-C482 outside the Hang Khong building (Google Earth co-ordinates N21.045217, E105.880761), where it has been on display since 2004. **BELOW** An optical Ilyushin? The former VN-C516, marked as "C-482", at the Hanoi Military Museum in 2016 (N21.032859, E105.840061).



The museum "C-482" is actually the former VN-C516, an Il-14G cargo variant. Both Il-14s are recorded as having been withdrawn at Gia Lam in the mid-1990s, after which C-516 was stored and refurbished as "C-482" by No 918 Air Force Regiment. It was put on display and unveiled at the museum in 2012.





Find us on Facebook at www.facebook.com/TheAviationHistorian
The Aviation Historian and Twitter @AvHistorian



Coming up in future issues:

National — Airline of the Stars Award-winning aviation historian David H. Stringer profiles the genesis and development of maverick founder G.T. "Ted" Baker's National Airlines

Defending the Reich Robert Forsyth opens a new series on Erprobungskommando 25, a specialist unit formed to devise radical solutions to the USAAF's bombing campaign

Suez: The Egyptian Perspective Tom Cooper commemorates the 60th anniversary of the Suez crisis with an examination of Egypt's air activities during the conflict



The Aviation Historian®

The modern journal of classic aeroplanes and the history of flying

Be certain to receive each new issue of The Aviation Historian hot off the presses, by taking out a subscription. It's quick and easy to do. Issue 17 published October 15, 2016

PRICES HELD SINCE LAUNCH IN 2012!

Annual Print Subscription for one year (4 issues): **£44 (UK), £53 (Europe), £62 (RoW)**

See our website for more details of both print and digital versions:

www.theaviationhistorian.com

TEL 07572 237737 **WRITE** TAH, PO Box 962, Horsham RH12 9PP, UK

Digital edition available via our partners **pocketmags.com**



WHAT THEY'RE SAYING ABOUT THE AVIATION HISTORIAN



"Three years' issues on the bookshelf now, and still enjoying the scope & quality of the content to the extent I did on seeing **TAH1**" — aviation historian Mike Hirst

"If you can't find something that piques your interest here, your passion is not what you thought it was!" — *Classic Wings* magazine

"Lively and engaging . . . research-rich, factually dense and of academic value" — Minerva Miller, University Librarian, University of London

"Impressive content . . . this is a work of reference to keep" — *NZ Aviation News*

"The Aviation Historian is the best English-language aviation history publication available today" — aviation historian Tom Cooper

BEA and the trident saga / 125 shootdown in angola / new york airways /
norway's wartime transport service / silver city in libya / german-japanese
technological co-operation / leefe robinson VC / custer and the channel wing

